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STATISTICS

2433 ANDERSON, E.
Natural history, statistics, and applied mathematics.
Amer. J. Bot. 1956 : **43** : 882–89.

Mistakes which may result from placing too much reliance on statistical methods in the study of biological problems are discussed.

2434 KRAMER, C. Y. & BRADLEY, R. A.
Factorials in near balanced incomplete block designs for k(k-q) treatments. (Preliminary report).
Virginia J. Sci. 1956 : **7** : p. 362. (Abst.)

By imposing factorial arrangements of treatments on near-balanced incomplete block designs with $k(k–q)$ treatments and making use of orthogonal contrasts, the sums of squares for factorial effects with one degree of freedom are found as functions of the estimated treatment effects. A complete analysis of variance for the factorials is developed.

2435 HÜBNER, R.
Ein graphischer Ertragsvergleich unter Berücksichtigung der Grenzdifferenzen (GD), dargestellt an den Ergebnissen einer Futterroggen-Prüfung. (**A graphical method of comparing yields based on limiting differences (GD) and exemplified by the results of a fodder-rye trial**).
Z. Acker- u. PflBau. 1957 : **102** : 299–310.

A graphical method of representing the significance level of the yield differences between each pair of treatments in an experiment is described. The method can also be used for grouping the treatments into yield classes.

2436 PASCUAL, R. N.
A comparison of the efficiency of randomized blocking and of complete randomization in pot tests.
Philipp. Agric. 1954 : **38** : 435–43.

An experiment demonstrating the greater efficiency of randomized blocks over a completely random layout for rice trials is described.

GENETICS

2437 SIRKS, M. J.
Japanse genetica. (**Japanese genetics**).
Genen en Phaenen 1957 : **2** : No. 1 : 2–10.

The writer gives an account of impressions gained in the course of his visit to Tokyo in September 1956 to attend the International Genetical Symposium on Physical and chemical approaches to problems in chromosomes. In addition to discussing briefly the significance of some of the more important papers delivered, he describes visits to the University of Kyoto, the Agricultural Research Stations at Nishigahara and Hiratsuka and the National Institute of Genetics at Mishima and reviews breeding and cytogenetical work there on rice, wheat, radish and other plants.

2438 FERGUSON, J. H. A.
Some applications of binomial probability paper in genetic analyses.
Euphytica, Wageningen 1956 : **5** : 329–38.

The use of binomial probability paper for estimating graphically the significance of differences between observed and expected genetical segregation data is exemplified.

2439 LEWIS, H.
Genetics and cytology in relation to taxonomy.
Taxon, Utrecht 1957 : **6** : 42–46.

Examples of the ways in which genetical and cytological investigations can help to solve taxonomic problems are described and discussed from the point of view that genetic discontinuity resulting from evolutionary processes should form the basis of a satisfactory classification.

2440 LEDERBERG, S. S.
Genetic functions of prophage : interference with the multiplication of heterologous bacteriophages.
Diss. Abstr. 1956 : **16** : Publ. No. 15,236 : 845–46.

The interactions between T2 and lysogenic P2 and between T1 and lysogenic P1 are described. The following results are of particular interest. About 1 in 10^4 of T1-infected cells of *Escherichia coli* 'B' containing prophage P1 liberated T1. Some of the T1-yielding cells produced the normal form whereas others gave rise to both normal T1 and a modified form which was able to grow in cells of *E. coli* and *Shigella dysenteriae* free from, or containing, prophage P1. In simultaneous mixed infection of *E. coli* 'B' + P1 with normal and modified T1, the normal phage succeeded in contributing genetic characters. Certain bacterial mutations to streptomycin resistance interfered with the suppression

of heterologous phages by either prophage P1 or P2; this effect did not involve any change in the prophage itself.

2441 JENKINS, J. A.
R. E. Clausen, geneticist.
Science 1956 : **124** : p. 1286.

An obituary account is given of the genetical research, notably on *Nicotiana*, carried out by R. E. Clausen.

2442 NEI, M. & SYAKUDO, K.
Genetic analysis of covariation in quantitative characters. I. The components of covariance and the test of change in correlation.
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 201–06.

A method of partitioning the covariance between two characters into fixed genetic, unfixed genetic and environmental components is developed. A technique for testing change in genetic correlation in successive generations is also described. The mating systems considered were selfing, biparental cross and back cross.

2443 SEYFFERT, W.
Vorläufige Mitteilung über Untersuchungen zur Gendosiswirkung. (**Preliminary report on studies on the effect of gene dosage**).
Ber. dtsch.bot.Ges. 1956 : **69** : 435–40.

The mechanism of quantitative inheritance was studied in tetraploid forms of *Antirrhinum majus* and *Silene armeria* obtained by colchicine treatment. The presence in the tetraploids of twice the gene dosage present in the original diploid strains resulted in a stronger expression of the factors *El* and *F*, controlling flower colour in *A. majus* and *S. armeria* respectively.

2444 EL-ANI, A. S.
Ascus development and nuclear behavior in *Hypomyces solani* f. *cucurbitae*.
Amer. J. Bot. 1956 : **43** : 769–78.

This article continues the studies reported in *PBA**, XXIV, Abst. 2703 and XXV, Abst. 736. Sex is determined by two pairs of alleles, c^+c and m^+m, which are located on the same chromosome, the former pair determining the ability to produce perithecia and the latter the ability to produce spermatia. Thus hermaphrodite thalli are genotypically c^+m^+, female thalli c^+m, male thalli cm^+ and neuter thalli cm.

In addition, two compatibility factors are known, *A* and *a*, which are inherited independently of the sex-determining alleles. Fertilization can therefore only take place if the thalli are compatible, one *A* and the other *a*, and if one carries the gene c^+ and the other m^+. Crossing over between c^+ and m^+ is suggested to explain the origin of hermaphrodites and neuters from the cross ♀ x ♂.

2445 WHITEHOUSE, H. L. K.
Use of tetratype frequencies for estimating spindle overlapping at the second division of meiosis in 'ordered' tetrads.
Nature, Lond. 1957 : **179** : 162–63.

It is shown how tetratype data can be used to detect partial or complete overlapping of the spindles during spore formation within the ascus.

2446 PARSONS, P. A.
Genetical interference in maize.
Nature, Lond. 1957 : **179** : 161–62.

Back-cross linkage data on maize have been examined to ascertain how far they are consistent with Owen's theory of genetical recombination (cf. *PBA*, XIX, Abst. 2289). Generally speaking, Kosambi's coefficient was found to equal 1 at the metrical mid-arm. The hypotheses of no interference across the centromere, independent distribution of intercept lengths and lack of repressive effect of terminus on chiasma formation were consistent with the data studied. It also appeared that $4u \exp(-2u)$ can be used to represent the interference function.

2447 HAYES, W.
The kinetics of the mating process in *Escherichia coli*.
J. gen. Microbiol. 1957 : **16** : 97–119.

The process of zygote formation may be studied by treating samples, removed at intervals from a parental mixture, with virulent phage to which only the donor Hfr or F+ strain is susceptible; only zygotes already formed at the time of treatment can give rise to recombinant cells. Using this technique, the prototrophic markers $T+L+$ and $Lac+$ were found to have the same time and order of entry into the recipient cells in both Hfr × F− and F+ × F− mixtures. Support was therefore obtained for the finding of Wollman and Jacob that the genetic transfer is an oriented process corresponding to the order

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of the genes in the chromosome (cf. *PBA*, XXV, Abst. 2752). In the Hfr × F— cross, zygote formation was suppressed upon an unsupplemented medium and required the presence of both glucose and sodium aspartate. Zygote formation proved to be a temperature-dependent process, occurring in the absence of multiplication of either parent and unaffected by DNase. The number of zygotes, and therefore of recombinants, formed in a given time was a function of (1) the frequency and intimacy of chance contacts and (2) the time required for genetic transfer which in turn depended upon the available energy resulting from carbohydrate oxidation. Alteration of the pH of the medium and of the density of the parental population modified the frequency of effective contact but not the times of entry of Hfr genes into F— cells. Segregation of haploid recombinant cells from Hfr + F— zygotes at 37° took place in nutrient broth in about 140 min., and on minimal agar at about 160 min., after mixing the parental suspensions. The phenotypic expression of resistance to sodium azide, inherited from the Hfr parent, was initiated shortly after the zygotes were formed and became complete just before segregation. Resistance to phage was however not expressed at all until the time of segregation and required four generations for completion.

2448 Fisher, K. W.
The role of the Krebs cycle in conjugation in *Escherichia coli* K-12.
J. gen. Microbiol. 1957 : **16** : 120–35.

Zygote formation between F+ or Hfr and F— cells depended on a supply of free energy made available by carbohydrate oxidation via the Krebs-cycle reactions. Synthesis of protein or nucleic acids was not necessary for zygote production.

2449 Fisher, K. W.
The nature of the endergonic processes in conjugation in *Escherichia coli* K-12.
J. gen. Microbiol. 1957 : **16** : 136–45.

The free energy required for zygote formation in crosses between Hfr or F+ cells and F— cells is utilized only by the donor cells, in the establishment of effective contact and in the subsequent transfer of genetic material to the F— recipient. Energy is not required to hold the cells in contact throughout the mating process. The influence of the pH of the medium upon the frequency of zygote formation is explained in terms of a surface effect.

2450 Zacharias, M.
Ein Versuch zur Beeinflussung der F_2-Spaltungen von Bastarden aus der Gattung *Antirrhinum* durch Pfropfung von F_1-Bastarden auf ihre Ausgangseltern. (**An attempt to influence the F_2 segregation ratios of hybrids of the genus *Antirrhinum* by grafting F_1 hybrids on their parent forms**).
Kulturpflanze, Berlin 1956 : No. 4 : 277–95.

At the Institute of Genetics, Halle University, Germany, F_1 hybrids from crosses between six genotypically different forms of *A. majus* were grafted on to their parent forms but no evidence to support claims by Russian research workers that heritable changes could be effected by grafting was obtained, the F_2 segregation ratios remaining unaffected by this treatment.

2451 Papazian, H. P.
Modes of tetrad formation.
Amer. Nat. 1957 : **91** : No. 856 : 63–64.

Commenting on the article by Bennett, summarized in Abst. 29, the author claims that it may be of considerable genetic importance to know on which of two genotypically different strands a multiple break has occurred. He also claims that the distinction between tetrads W, X; Y, Z and W, X; Z, Y is of significance and can be used to show that the order of the four chromatids after terminalization of chiasmata in the first meiotic division is preserved through the second meiotic division.

2452 Terada, M., Kondo, I. & Ogawa, T.
Studies on genetic recombination in bacterial viruses.
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 176–83.

Evidence of genetic recombination in respect of plaque morphology and host range was found in respect of bacteriophages isolated from *Salmonella gallinarum* and *S. sendai*.

2453 Wricke, G.
Einige Beispiele für die Anwendungsmöglichkeit der Matrizenrechnung in der Berechnung der Zusammensetzung spaltender Generationen von Selbstbefruchtern. (**Some examples of possible application of matrix methods for determining the composition of segregating generations of self-fertilizing populations**).
Z. Pflanzenz. 1956 : **36** : 413–20.

The use of matrix methods for determining the genetic composition of the F_0–F_n of a Mendelian

population segregating for any number of factors is illustrated.

2454 Lindegren, C. C. & Shult, E. E.
The interpretation of genetical data.
Experientia 1957 : **13** : 48–51.

The following assumptions commonly made in the calculation of linkage relations are discussed, evidence being presented to support the view that they are false: (*a*) that the gene is stable in the heterozygous condition, (*b*) that crossing over in the four-strand stage is at random, i.e. that chromatid interference does not occur and the frequency of 2, 3 and 4-strand double exchanges is 1 : 2 : 1, (*c*) that a low frequency of recombination indicates a low frequency of crossing over, (*d*) that positive chromosomal interference occurs, i.e. that one cross-over inhibits crossing over in an adjacent region of the same chromosome, (*e*) that the centromeres segregate at random and (*f*) that crossing over on one chromosome is independent of crossing over on any other chromosome.

2455 Sobels, F. H. & van Steenis, H.
Chemical induction of crossing-over in *Drosophila* males.
Nature, Lond. 1957 : **179** : 29–31.

Treatment with formaldehyde, dihydroxydimethyl peroxide and mustard gas induced crossing over. The effectiveness of the first two compounds in this respect paralleled their mutagenic effectiveness but mustard gas was less effective in inducing cross overs than in causing mutations.

2456 Ryan, F. J.
Contributions from microbiology to the concept of the gene and allelism.
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 266–78.

This review deals principally with evidence drawn from microbiology on the nature of pseudoallelism.

2457 Cleland, R. E.
Cytology: the study of the cell.
Amer. J. Bot. 1956 : **43** : 870–81.

Among other topics discussed in this article are the nature of the gene, its location in the cell and its cytological identification, the hereditary characteristics of plastids and other cytoplasmic inclusions and the bearing of cytological studies on taxonomy.

2458 Crawford, L. V.
Deoxyribonucleic acid synthesis in bacteriophage-infected *Escherichia coli*.
Biochem. J. 1957 : **65** : p. 17P.

Using chloramphenicol as a means of inhibiting protein synthesis, it was found that prior synthesis of protein was necessary for the synthesis of the DNA of T-even phages but apparently not for that of T-odd phages, 201S and C1. The generalization that protein synthesis is prerequisite to the initiation of the synthesis of new DNA therefore requires re-examination (cf. *PBA*, XXVI, Abst. 3038 and XXVIII, 2464).

2459 Crescini, F.
Sulla eredità citoplasmatica. (**On cytoplasmic inheritance**).
Ital. agric. 1957 : **94** : 161–66.

Studies of cytoplasmic inheritance in species of *Phaseolus*, *Vicia*, *Epilobium*, *Linum* and other plants are reviewed and the plasmagene theory is discussed. The interaction between hereditary factors in the cytoplasm and the genome is emphasized and the possibility that this may be complicated by seed transmission of viruses is mentioned.

2460 Edwardson, J. R.
Cytoplasmic male-sterility.
Bot. Rev. 1956 : **22** : 696–738.

Reports of the occurrence of cytoplasmic male sterility in plants are reviewed under the following headings: cases arising from intergeneric crosses; those arising from interspecific crosses; those arising from intraspecific crosses; apparently spontaneous occurrences; and doubtful cases. A final section deals with cytoplasmic male sterility in animals.

2461 Haldane, J. B. S.
The conditions for coadaptation in polymorphism for inversions.
J. Genet. 1957 : **55** : 218–25.

"Criteria are found for the stability of a balanced polymorphism due to chromosomal inversions in autosomes. Roughly speaking, it is necessary that heterosis should be cumulative, that is to say that heterozygosis at any locus concerned in the genetical polymorphism should have a greater effect in raising fitness when the other loci concerned are heterozygous than when they are homozygous. The conditions when one inversion carries a sex-determining mechanism are much less stringent. Here a single gene may be enough to make an inversion selectively advantageous." [Author's summary].

Mutation. Brookhaven Symposia in Biology. 1955 : No. 8 : Pp. 231.

Contributions likely to be of most interest to plant geneticists are abstracted below.

2462 *Stern, K. G. Introduction.* (*pp. 1–2*).

General comments are made upon the possible

nature of mutation, as suggested by the discoveries and concepts of modern chemistry and physics.

2463 *Benzer, S. Genetic fine structure and its relation to the DNA molecule.* (*pp. 3–5*).
Investigations referred to in *PBA*, XXVI, Abst. 977 are briefly described.

2464 *Hershey, A. D. The organization of genetic material in bacteriophage T2.* (*pp. 6–14*).
On the basis of the results of experiments carried out by himself and his colleagues at the Carnegie Institute of Washington, Cold Spring Harbor, New York, the author reaches the following conclusions. The hereditary substance of a resting particle of T2 phage is composed of $2 \times 10^{-11}\mu$g. of DNA, associated with not more than $10^{-11}\mu$g. of protein and possibly with other minor components. The possibility that only a fraction of this material is genetically potent is not excluded. Replication of the nucleic acid in the infected cell occurs independently of concurrent protein synthesis. Synthesis of some protein is however a prerequisite to the initiation of nucleic-acid synthesis (cf. Abst. 136).

2465 *Ravin, A. W. The properties of bacterial transforming systems.* (*pp. 33–48*).
Transformation in pneumococci is discussed. The author describes cases of allogenic transformation, in which an agent different from that used to induce the transformation is recovered from transformed cells. In order to explain allogenic alterations and also nonindependent transformations by two different agents of common cellular origin, the hypothesis that transforming agents occupy specific loci within an organized genetic structure is put forward. According to this view, an allogenic transformation is the result of the interaction of two homologues, whereby another homologous agent is reconstituted. Transformations appear to occur within a "sensitized" fraction of the treated population, the size of the fraction depending upon the physiological state of the bacteria. When sensitized, the cells react rapidly with the transforming agent. Although the consequences of contact with the agent are not immediately expressed, the changes leading to eventual transformation are not reversible by the DNA-depolymerizing action of DNase. Nonindependent action between two agents of common cellular origin may be masked by the effect of agglutination.

2466 *Bertani, G. The role of phage in bacterial genetics.* (*pp. 50–57*).
Temperate phage P2 may occupy at least three different sites in the nucleus of the bacterial host, as suggested by data from crosses between superinfected lysogenic cells carrying P2 prophages as bacterial genetic markers (cf. *PBA*, XXV, p. 451). One of the sites is occupied more often than the others. This standard site also behaves differently from the others with respect to phage production and participation in prophage recombination. The typical immunity of lysogenic cells from superinfection is regarded as being physiologically controlled and not due to competition for the standard site of prophage attachment.

2467 *McClintock, B. Intranuclear systems controlling gene action and mutation.* (*pp. 58–71*).
With reference to investigations already reported by the author and other workers, the control of gene action and mutation in maize by *Ac*, *Ds* and other chromosomal elements and by systems of such elements is discussed. It is suggested that such elements are normal components of the chromosome complement in maize and possibly other organisms.

2468 *Demerec, M. & Demerec, Z. E. Analysis of linkage relationships in* Salmonella *by transduction techniques.* (*pp. 75–84*).
Evidence is presented in support of the hypotheses that a chromosome fragment introduced by transducing phage into a recipient *Salmonella* bacterium is incorporated in the chromosome of some of the progeny of that bacterium by crossing over (cf. *PBA*, XXVI, Abst. 243). Transduction experiments have also suggested that different groups of auxotrophic mutants depend upon genes within corresponding complex loci and that in the case of each of these loci the order of the genes on the linkage map follows the sequence of the biosynthetic reactions controlled by the genes in question (cf. *PBA*, XXVI, Abst. 919 and XXVII, Abst. 137).

2469 *Newcombe, H. B. The timing of induced mutations in Streptomyces.* (*pp. 88–101*).
The process of ultraviolet-induced mutation does not appear to be completed until after considerable delay. The mutagenic effects of this type of radiation were found to remain partially photoreversible for somewhat less than half the period elapsing between the time of irradiation and first nuclear division. Conditions causing delay in nuclear division also delayed the transition from a photoreversible to a

photostable mutagenic effect. It is therefore inferred that completion of mutation depends upon the cell metabolism after ultraviolet irradiation. The evidence that X-ray-induced mutation does not occur during the actual treatment is less direct and is provided mainly by similarities with the mutagenic effects of ultraviolet rays with respect to (1) a period of sensitivity at the early stage of spore germination, (2) the dose-response relationship and (3) the modification of the mutational response by various postirradiation treatments.

2470 *Giles, N. H. Forward and back mutation at specific loci in* Neurospora. (*pp. 103–23*).

In investigations on mutation with respect to tryptophane and adenine requirements, reverse mutants intermediate between the mutant and wild types were obtained, in addition to mutants phenotypically and genetically indistinguishable from the wild types (cf. Abst. 1425). In the case of the locus for inositol utilization, some evidence of pseudoallelism has been found. According to the results of heterocaryon and genetic tests, the adenine-requiring mutants obtained by X irradiation comprise two biochemically distinct groups, arising respectively through mutation at two closely-linked loci (*ad*–3_A and *ad*–3_B) in linkage group I (cf. Abst. 1103). Each group comprises both irreversible and reversible mutants, the linkage relationships of the latter usually being normal but those of the former abnormal. Possibly the irreversible mutants had resulted from extragenic alteration as well as deficiency at one of the *ad*–3 loci. Most of the evidence available indicates that a reverse mutational event at one *ad*–3 locus does not affect the second locus.

2471 *Muller, H. J. On the relation between chromosome changes and gene mutations.* (*pp. 126–47*).

With reference to the literature on *Drosophila*, maize and other organisms, the author discusses the evidence in favour of (1) regarding the chromosome as segmented, (2) the occurrence of intragenic as well as of intergenic change, and (3) the similarity of the events responsible for chromosomal and genic alterations.

2472 *Stone, W. S. Indirect effects of radiation on genetic material.* (*pp. 171–88*).

Literature on the indirect genetic effects of different types of radiation upon *Drosophila, Tradescantia, Neurospora* and other organisms is surveyed.

2473 *Baker, W. K. The oxygen effect and the mutation process.* (*pp. 191–200*).

Chiefly with reference to the literature on *Drosophila, Tradescantia* and *Vicia*, the author examines the validity of some generalizations which have been made concerning the effect of oxygen upon the frequency of induced chromosomal aberrations.

2474 *Novick, A. Mutagens and antimutagens.* (*pp. 201–14*).

Under aerobic conditions in the chemostat with tryptophane as the controlling growth factor, purines or purine derivatives had a nontoxic mutagenic effect upon *Escherichia coli*, as indicated by the production of phage-resistant mutants. Except in the case of tetramethyluric acid and benzimidazole, the mutagenic action was completely suppressed by very low concentrations of adenosine, guanosine and inosine. These nucleosides did not alter the rate of mutation induced by ultraviolet or γ radiation but reduced the rate of spontaneous mutation by two-thirds (cf. Abst. 1403). Under anaerobic conditions, the rate of spontaneous mutation was very low and the bacteria were highly resistant to the mutagenic action of purine derivatives. It is suggested that the spontaneous mutation could be largely accounted for by the action of a purine-type of mutagen which was the result of the normal metabolism of the cell under the tryptophane-limited conditions in the chemostat. Resistance to the effect of purines under anaerobic conditions is ascribed to the presence of appreciable concentrations of nucleosides under such conditions. When the bacteria are growing at very high rates, the occurrence of some other chemical mutagen or mutagens must however be postulated, since at very short times of generation the rate of spontaneous mutation is little affected by adenosine or by growth under anaerobic conditions.

2475 Terada, M., Kondo, I. & Ogawa, T. **The plaque dissociation phenomenon in bacterial viruses and its genetic analysis.**
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 259–65.

The so-called s bacteriophages infecting *Salmonella* spp. give rise to transparent sectors when inoculated into some *Salmonella* strains but not into others. The transparent sectors, on replating, give rise to transparent plaques of the so-called r type; the r strains show no tendency to revert to the s types. Recombination experiments provide support for the view that the

dissociation described is a consequence of viral heterozygosity.

2476 Howell, E. V. (Jun.).
Studies on an antagonistic phenomenon of a parent population of *Escherichia coli* against a citrate-utilizing mutant population.
Diss. Abstr. 1956 : **16** : Publ. No. 16,885 : p. 1317.
The mutant was inhibited by a substance produced by the parent strain. Mutants resistant to this substance were isolated.

2477 Yanofsky, C.
Enzymatic studies with a series of tryptophan auxotrophs of *Escherichia coli.*
J. biol. Chem. 1957 : **224** : 783–92.
Three of the auxotrophic mutants investigated lacked more than one of the enzymes involved in the conversion of anthranilic acid and indole into tryptophane. Two of these three mutants arose through deletion of genetic material.

2478 Kurahashi, K.
Enzyme formation in galactose-negative mutants of *Escherichia coli.*
Science 1957 : **125** : 114–16.
Single gene Gal — mutants fell into two groups respectively lacking galactokinase and galactose-1-phosphate uridyl transferase. Two (Gal_2 — and Gal_8 —) of the three genes associated with lack of galactokinase are known to be linked but the third gene (not yet symbolized) belongs to a different linkage group.

2479 Barnett, H. L.
Variation in the oak wilt fungus, *Endoconidiophora fagacearum.*
Proc. W. Va. Acad. Sci. 1955 : **27** : 25–29.
Studies of spontaneous and ultraviolet induced mutants have shown that they vary considerably in their nutrient requirements, particularly in respect of their response to vitamins. Further mutants behaving as unisexual males have been observed in aging cultures and in cultures subjected to ultraviolet irradiation (cf. *PBA*, XXIII, Abst. 2558).

2480 Levine, M.
Mutations in the temperate phage P22 and lysogeny in *Salmonella.*
Virology 1957 : **3** : 22–41.
"All the clear-plaque forming mutants of phage P22 can be classified into three groups; c_1, c_2 and c_3. The corresponding mutations occur at three loci within a small region of the phage linkage map.
"In mixed infection with a virulent mutant of the c_2 type, phage c_1, which lysogenizes very little or not at all by itself, lysogenizes as well as the wild type temperate phage. The early development of clones giving rise to lysogenic bacteria through the c_1–c_2 interaction has been studied. The significance of these interactions to an understanding of the processes leading to lysogeny is discussed." [Author's summary].

2481 Kaiser, A. D.
Mutations in a temperate bacteriophage affecting its ability to lysogenize *Escherichia coli.*
Virology 1957 : **3** : 42–61.
"Forty independently occurring clear plaque-forming mutants of λ have been isolated. Among them three different phenotypes can be recognized. Crosses between mutants indicate that all of the mutant loci are closely linked to one another, occupying a segment of the λ linkage group which is about 1/10 of the total known genetic length. More detailed mapping reveals that the mutant loci fall into three adjacent regions, one for each phenotype.
"Mixed infection with a pair of phenotypically different mutants, each of which lysogenizes very poorly or not at all, produces the high frequency of lysogenization characteristic of infection with wild type. This phenomenon is called co-operation. The bacteria surviving such a mixed infection are lysogenic either for one or both of the infecting types of phages. Two non-allelic clear mutations having the same phenotypic expression show a *cis–trans* position effect in lysogenization." [Author's summary].

2482 Faris, D. D.
Biochemical characterization of some chemical induced mutants of *Escherichia coli.*
Diss. Abstr. 1956 : **16** : Publ. No. 16,934 : p. 1316.
Manganous chloride had a multiple mutagenic effect upon a streptomycin-dependent strain. All the mutants induced differed from the parent not only in being streptomycin-independent but by one or more alterations in fermentative capacities, sensitivity to bacteriophages and response to antibiotics. Many of the mutants differed from the parent in several respects. None of the mutants were auxotrophic and none had changed in respect of nonfermentative properties such as the production of indole and acetylmethyl carbinol.

2483 Alihanjan, S. I. & Mindlin, S. Z.
(The lethal and mutagenic action of ultraviolet rays on microorganisms).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1956 : **17** : 413–35. [Russian].

A detailed review is given of the work of Lea, Demerec, Kelner, Dulbecco, Latarjet, Wyss and many others on ultraviolet-induced mutations and photoreactivation. It is pointed out that the effect of a number of factors on mutation rate and on lethality is not the same and that different organisms, even different strains of the same organism, often react differently in respect of both. Strict control of both the genetical constitution of the experimental material and of the environment under which the experiments are carried out is thus necessary in drawing conclusions particularly concerning the mechanism of action of irradiation.

2484 Head, J. J.
The reduction of nitrate to nitrite by *Neurospora crassa*: a physiological and genetical study.
Abstr. Diss. Univ. Camb. 1954–1955 (1957) : 21–22.

Mutants unable to use nitrate as the sole source of nitrogen were induced by ultraviolet radiation and nitrogen mustard. Most of them were unstable and reverted to the capacity to grow on a nitrate-containing medium. Analysis of four nitrateless strains obtained by other workers revealed that two of the genes concerned were identical or very closely linked.

2485 Grigg, G. W.
The back mutation assay method and cellular interaction in *Neurospora crassa*.
Abstr. Diss. Univ. Camb. 1954–1955 (1957) : 20–21.

Such factors as suppression of prototrophic by auxotrophic cells, the minimal medium used and photoreactivation affected the results of the above method. The effects of the genes *col*–1, *m*, *sm* and *act* on conidial characters were investigated.

2486 Ishikawa, T. & Tanaka, N.
The reversion types in the homocysteineless strain of *Ustilago maydis*.
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 241–49.

U. maydis '42–4', which requires l-homocysteine or l-methionine for normal growth, has a spontaneous reversion rate of $2{\cdot}3 \times 10^{-5}$ per sporidium on a minimum medium supplemented with 1×10^{-5} mg./ml. methionine. Reversion occurs via two intermediate but stable stages.

2487 Sasa, T., Morimura, Y. & Yanagita, T.
Studies on the development of resistance of microorganisms to antibacterial substances. III. Some observations on the selective growth of drug-resistant mutants during the course of culture.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1953 : **66** : 71–76.

Evidence was obtained from growth curves of *Staphylococcus aureus* and *Escherichia coli* cultured in the presence of penicillin, streptomycin or furacin in favour of the view that microbial adaptation to antibiotics occurs through selection of resistant cells, either originally present or arising by mutation.

2488 Sussman, A. S.
Physiological and genetic adaptability in the fungi.
Mycologia 1957 : **49** : 29–43.

This review of the literature includes a discussion of the adaptive role of heritable cytoplasmic particles and of the nucleus in heterocaryosis and in subsidiary modes of nonsexual variation.

2489 Ryžkov, V. L.
(Questions of general biology in the Large Soviet Encyclopedia).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 1038–42. [Russian].

The second edition of the Encyclopedia is criticized for its presentation of unsubstantiated results such as spontaneous generation and vegetative hybridization; sections such as those on chromosomes and genetics are shown to be unscientific in giving a one-sided and inaccurate account of the views of modern biologists, some being quoted; well-established facts, such as sex linkage, affecting many characters of practical importance are not explained; statements that "the intensity of the vital processes constitutes vitality" are not found to add clarity to established concepts such as heterosis; polemical remarks and epithets are found to take the place of objective factual statements and the suggestion is made that the sections in question should be revised and rewritten.

2490 Poljanskiĭ, V. I.
(Elucidation of the problem of the species and the origin of species in the journal "Natural Science in School").
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 1046–50. [Russian].

The journal is criticized for misleading articles

concerning the origin of species, interspecific conversion, intraspecific competition and other biological problems and for ignoring recent criticisms of the Lysenko theory.

2491 Olenov, Ju.M.
(Does the possibility of vegetative hybridization constitute evidence against the role of the chromosomes in heredity?)
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 1001–05. [Russian].

Experimental results published both in the Soviet Union and elsewhere are referred to in which attempts to produce graft hybrids by the methods described by Lysenko and his school have failed. Phenomena such as transformation and transduction are referred to as showing the role of nucleic acids in inheritance and it is suggested that if cases arise in which a hereditary effect from grafting is confirmed, they will provide further evidence of the action of nucleoproteins, or some of their constituents such as aminoacids or peptides, in hereditary transmission and will not give proof of the inheritance of acquired characters or disprove the chromosomal theory of inheritance.

2492 Freitag, C. R.
Soviet opposition to Lysenko.
Plant Sci. Bull. 1956 : **2** : No. 2 : 5–6.

Some of the recent criticisms of Lysenko in the Soviet technical and general press are briefly noted and discussed.

2493 Skripčinskiĭ, V. V.
(The principal problems of plant ontogeny in the light of I. V. Mičurin's theory).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) 1956 : No. 4 : 53–66. [Russian].

This exposition of Mičurinism includes a discussion of the heritable effects of environment upon plants, especially young plants.

2494 Lipaeva, L. I.
(Concerning T. D. Lysenko's views on "vigour" in plant and animal organisms).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) 1956 : No. 4 : 67–74. [Russian].

Lysenko's views on inheritance and vigour (cf. *PBA*, XXIII, Abst. 847), which are stated to conflict with Darwin's writings and with recent observations by plant breeders, are rejected. Fallacies inherent in Lysenko's theories are said to be responsible for the suspension in the USSR of such valuable breeding methods as polyploidy, inbreeding and selection and vegetative reproduction of sports.

2495 Lysenko, T. D.
(Concerning the biological species and the origin of species).
Agrobiologija (Agrobiology) 1956 : No. 4 : 3–30. [Russian].

The writer states that the discussion of his evolutionary theories (cf. *PBA*, XXI, Abst. 2500) by his critics in the *Botaničeskiĭ Žurnal* has created confusion. His principal views are reiterated.

2496 Platonov, G. V.
(The principle of determinism in Mičurin's theory).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. : 1956 : No. 3 : 15–30. [Russian].

An appreciative account of Lysenko-Mičurinism, in particular of inheritance of acquired characters, is presented from the viewpoint of Marxist philosophy.

2497 Efroimson, V. P.
(The role of experiments and figures in agricultural biology).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) 1956 : No. 5 : 83–91. [Russian].

The disregard of experimental evidence and arbitrary conclusions drawn from it by some Soviet research workers are criticized. Thus, deviations from theoretical segregation ratios are to be expected on statistical grounds but have been attributed to the effects of external agents. Conspicuous yield decreases have resulted from open pollinations of rye and cotton but have been interpreted as indicating that the egg cell selects the pollen which gives rise to the highest-yielding progeny.

2498 Ivanovskaja, Y. L.
(The problem of intraspecific relations in plants).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1956 : No. 23 : 100–36. [Russian].

Evidence from experiments at Gorki Leninskie on wheat, oak, tomato and other plants is cited in support of Lysenko's version of Darwinism. Overpopulation is said not to intensify intraspecific competition but on the contrary to promote the survival of the species.

2499 Sakai, K.
(Theoretical studies on the technique of plant breeding. III. A selection index for individual plants of an autogamous population based on weights derived from measurements of individual plants, lines and groups of lines).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 175–79. [Japanese].

The selection index X is given by $b_1x_1 + b_2x_2 + b_3x_3$, where x_1, x_2, x_3 are the phenotypic value of an individual, the mean of the line and the mean of the group of lines, respectively, and b_1, b_2, b_3 are weight factors computed so as to produce a maximum correlation between X and Y, the genetic value of the individual. Modifications of the formulae given to allow for intergenotypic competition are also provided (cf. *PBA*, XXVI, Abst. 1971).

EVOLUTION

2500 Popov, M. G.
(The question of the origin of the angiosperms).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 768–69. [Russian].

The author defends his view that the angiosperms originated by hybridization between members of the Cycadales and the Gnetales.

2501 Skripčinskiĭ, V. V.
(The principal problems of plant ontogeny in the light of I.V. Mičurin's theory. II.)
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) 1956 : No. 5 : 67–82. [Russian].

The author accepts Darwin's theory without Lysenko's modifications and shows that the problems investigated by Darwin (phylogeny) and by Mičurin (ontogeny) are of a different, but complementary kind. Lysenko's theory of phasic development and the biological phenomena upon which it is based are discussed. The theory is criticized mainly on the grounds that (1) with the exception of one group, most plants are capable of development without passing through the vernalization and light phases and (2) the above phases are only a part of the complete cycle of development.

2502 Sharma, A. K.
A new concept of a means of speciation in plants.
Caryologia 1956 : **9** : 93–130.

The author gives a detailed account of the investigations and hypothesis referred to in *PBA*, XXVI, Abst. 1979.

2503 Löve, Á.
Biosystematic remarks on vicariism.
Acta Soc. Fauna Flora fenn. 1955 : **72** : No. 15 : 1–14.

True vicariads are taxa which have undergone morphological and genetical differentiation after their dispersal to new territory whereas false vicariads became differentiated prior to their dispersal into a new region. Ways in which true and false vicariads may be distinguished are outlined and some cases of American-European pairs of vicarious species are discussed in order to illustrate the value of biosystematics in classifying such taxa..

CYTOLOGY

2504 Seidenberg, M.
A possible link from the cytoplasmic metabolic reactions to the genes: the co-enzymes.
Experientia 1957 : **13** : 106–07.

A mechanism is suggested and discussed by means of which coenzymes such as DPN, TPN, FAD, CoA and others might carry information from the cytoplasm to the nucleus. It is postulated that when a coenzyme molecule is reduced, during metabolism, it may sometimes not be possible to reoxidize the molecule and the nucleotide component could then become incorporated in a chromosome. In this way chromosome growth would be controlled by the metabolic activity of the cell and the length and structural configuration of the chromosome would mirror the number of metabolic cycles which the cell had gone through.

It is further suggested that although each new set of chromosomes formed during the life of the cell is very similar to the previous set it is sufficiently different from them to provide the new enzyme systems necessary for the next stage of growth of the cell; the cell would therefore never exactly duplicate itself, but would produce a new cell, equipped with the enzyme systems necessary for the next phase of growth.

2505 Woodard, J. W.
DNA in gametogenesis and embryogeny in *Tradescantia*.
J. biophys. biochem. Cyt. 1956 : **2** : 765–76.

Photomicrometric studies of Feulgen-stained gametophytic and sporophytic nuclei of *T. paludosa*, carried out at the University of Wisconsin, have shown that gametophytic nuclei contain the lowest quantity of DNA, sporophytic nuclei contain twice or four times this amount

and endosperm nuclei three or six times, suggesting a close association between DNA and the number of chromosome sets.

2506 Adler, H. I.
Objective technics in bacterial nuclear cytology.
Diss. Abstr. 1956 : **16** : Publ. No. 18,293 1557–58.

Age of culture, nature of fixation, length of hydrolysis and the particular stain employed were found to influence nuclear structure, as observed by staining techniques in common use.

2507 Robinow, C. F.
The chromatin bodies of bacteria.
Bact. Rev. 1956 : **20** : 207–42.

Topics discussed in this review include (*a*) nuclear behaviour in organisms other than bacteria, (*b*) techniques of studying chromatin structures in bacteria, (*c*) behaviour of bacterial chromatin bodies, stress being laid on the resemblance to blue-green algae rather than to other organisms in this respect, and (*d*) claims of mitosis in bacteria and cocci.

2508 Taylor, J. H., Woods, P. S. & Hughes, W. L.
The organization and duplication of chromosomes as revealed by autoradiographic studies using tritium-labelled thymidine.
Proc. nat. Acad. Sci. USA 1957 : **43** : 122–28.

Autoradiographic investigations on roots of *Vicia faba* indicated that (1) DNA is synthesized as an entity which extends throughout the length of the chromosome and remains intact during succeeding replications and nuclear divisions, (2) a chromosome is composed of two such entities, probably complementary to each other, and (3) after each replication the four resulting units separate so that each daughter chromosome contains an "original" and a "new" unit. A model with two complementary units and a scheme of replication analogous to the Watson-Crick model for DNA is proposed.

2509 Sharma, A. K. & Sharma, A.
A theory regarding the stability of chromosome complement in a species.
Naturwissenschaften 1957 : **44** : p. 17.

Chromosome counts of a number of vegetatively reproducing species at the Cytogenetics Laboratory of Calcutta University, India, revealed the occurrence of variations in chromosome number in the growing shoots and root tips. Although the variant cells never outnumbered the normal cells, they amounted in the growing points of the shoots of some plants to as much as 30% of the total. Variant chromosome numbers were not observed in the leaves. It is suggested that the occurrence of variant chromosome numbers, which appear to arise as the result of somatic reduction and to be genetically controlled, is connected with the development of differentiation in the organs concerned.

2510 Jinno, T.
On the relation between the chromosome numbers and the flora growing in the coast of the inland sea in Japan.
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 147–50.

An investigation of the chromosome numbers of wild species growing along the coast of Ehime prefecture revealed that species found both along the shore and inland tended to have higher chromosome numbers than those confined to the coast.

2511 Sharma, A. K.
Fixation of plant chromosomes.
Bot. Rev. 1956 : **22** : 665–95.

The advantages and limitations of various fixatives and pretreatments are discussed with particular reference to their use in the study of detailed chromosome morphology.

2512 Swaminathan, M. S. & Natarajan, A. T.
Chromosome spreading induced by vegetable oils.
Stain Tech. 1957 : **32** : 43–45.

Prefixation soaking of seeds in castor, coconut, groundnut, sesame or mustard oils has been found to cause chromosome contraction and spreading in *Triticum monococcum*, *T. dicoccum*, *T. aestivum*, *Oryza sativa*, *Vicia faba* and *Nicotiana tabacum*. No chromosome stickiness was induced although breakage occurred in some cases if soaking continued for more than two hours. Castor oil was found to give the best results and a schedule for the treatment of seeds with this oil and subsequent staining is given (cf. Abst. 2525).

2513 Vézina, C. E.
The study of presumptive heterokaryons in *Aspergillus fonsecaeus*.
Diss. Abstr. 1956 : **16** : Publ. No. 16,220 : p. 846.

Heterocaryons obtained between colour mutants of *A. fonsecaeus* fell into three groups corresponding to three degrees of complementation: "blend" heterocaryons resulting from a dilution effect; grey-brown heterocaryons expressing incomplete complementation; and black heterocaryons in which complementation to produce

the pigmentation of the wild type was complete.

2514 Darlington, C. D. & Kefallinou, M.
Correlated chromosome aberrations at meiosis in *Gasteria*.
Chromosoma 1957 : **8** : 364–70.

Misdivision of the centromere and terminal and intercalary unions of chromatids have been found to occur spontaneously at anaphase I in a plant of *G. undulata*. It is stated that the occurrence of centric and chromatid types of error together has not been explicitly recognized before. The errors affected only the long chromosomes. The chromatid errors were confined to the median or distal segments of the long arms; the centromere therefore interfered with chromatid error. Misdivision led to the development of pollen grains containing isochromosomes and telocentrics which behaved as complementary when the grains underwent mitosis. It is pointed out that the survival of telocentrics in the pollen grains has not been previously observed in diploid species; the possible types of evolution they may undergo are briefly indicated.

2515 Inada, A.
(The untwisting of meiotic spirals during prophase of pollen mitosis).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1951 : **64** : 188–91. [Japanese].

The spiral structure of the chromosomes was investigated in pollen meiosis and mitosis of *Paris verticillata*. Up to 17 twists were observed in one arm of chromosome A at mitosis as against 11 major spirals at meiosis. Five modes of untwisting during meiosis are distinguished according to whether the untwisting proceeds uniformly over the whole length of the chromosome, or commences at the distal region, centromere, middle region or at both the distal region and centromere.

2516 Inada, A.
(Chromosome spirals in *Tradescantia paludosa*).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1952 : **65** : 192–94. [Japanese].

The senses of the spirals in the two arms of univalents are independent of each other. In bivalents, the senses of the spirals in free chromosome arms are independent; however, if a terminal chiasma is present, the arms meeting at the chiasma coil in opposite senses.

2517 Stern, H.
Sulfhydryl groups and cell division.
Science 1956 : **124** : 1292–93.

Analysis of developing microspores of *Lilium longiflorum* indicated that the concentrations of thiols and also of glutathione are high both before and after mitosis. No evidence was therefore obtained for Rapkine's view that conversion of –SS– to –SH radicals precedes mitosis. Nor was any support gained for Mazia's hypothesis that the concentration of glutathione varies directly with the degree of gelation of the spindle.

2518 Hagemann, R.
Untersuchungen über die Mitosenhäufigkeit in Gerstenwurzeln. (**Studies on mitotic frequency in barley roots**).
Kulturpflanze, Berlin 1956 : No. 4 : 46–82.

The distribution and frequency of mitotic divisions in root-tip cells of germinating barley seeds were studied. The mitotic frequency of the growing roots did not show any reaction to illumination and no diurnal rhythm was observed in seeds kept in total darkness at a temperature of 25° C. A rhythm in the process of mitotic division could, however, be induced by subjecting the germinating seeds to alternate periods of 12 hr. at 25° C. and 12 hr. at 5° C.

2519 Bailey, P. C.
Some notes on the influences of various buffer salts upon the rate of mitosis in root tips of *Trillium sessile* L.
Bull. Torrey bot. Cl. 1956 : **83** : 410–14.

The inhibitory effects of boric acid, potassium dihydrogen phosphate and potassium acid phthalate upon the rate of mitosis are described. Effects upon the mitotic figures, such as clumping at metaphase, are also noted.

2520 Sharma, A. K. & Bhattacharyya, B.
Vitamins : their property of inducing chromosome division in adult cells of plants.
Caryologia 1956 : **9** : 38–53.

Experiments on *Allium cepa*, *Hydrilla* and *Vallisneria* indicated that calcium pantothenate, nicotinic acid, succinic acid and thiamine were capable of inducing somatic reduction, as well as mitotic division, in polyploid and normal cells in differentiated tissue.

2521 Hiroaka, T.
Observational and experimental studies of meiosis with special reference to the bouquet stage. X. Response of chromosomes in meiotic prophase to centrifugal force.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1952 : **65** : 102–08.

Centrifugation experiments (1307 g.) on the pollen mother cells of *Lilium speciosum* have provided evidence of adhesion between the

chromosome ends and a localized region of the nuclear membrane at the bouquet stage of meiosis.

2522 Kurabayashi, M.
Denaturation of chromatin and its related phenomena observed in somatic tissues under low temperature.
Jap. J. Bot. 1955 : **14** : 349–64.
Cases of high frequencies of chromosome breaks induced in *Trillium kamtschaticum* and *Paris tetraphylla* by low temperature are described. In the case of the former species, some of the resulting micronuclei invaded neighbouring cells and reorganized themselves as supernumerary heterochromatic chromosomes.

2523 Avanzi, S.
"Non congressione," "non disgiunzione" ed altre aberrazioni mitotiche indotte dall'acetato di tallio in *Allium cepa*. **(Noncongression, nondisjunction and other mitotic aberrations induced by thallium acetate in *A. cepa*).**
Caryologia 1956 : **9** : 131–48.
Prophase segregation of chromosomes, spindle disturbances at metaphase and various anaphase and telophase aberrations were noted but the special interest of thallium acetate was found to be in its capacity to cause lagging in single chromosomes, owing it seems to the inactivation, partial or complete, of the centromere. It thus has the ability to induce both aneuploidy and chromosomal reduction.

2524 Bhaduri, P. N. & Natarajan, A. T.
Studies on the effects of nitrogen mustard on chromosomes in somatic and gametic plant tissues.
Indian J. Genet. 1956 : **16** : 8–23.
Investigations have been made at the Indian Agricultural Research Institute, New Delhi, of the cytological effect of nitrogen mustard at varying concentrations on root tip cells of *Triticum dicoccum, Zea mays, Vicia faba* and *Pisum sativum* and pollen mother cells of *T. durum* and *T. aestivum*. Among the effects observed in somatic cells of wheat were random breakage followed by the formation of micronuclei, stickiness and bridge formation, spindle failure, the formation of diplochromosomes and pycnosis. Higher concentrations were required to produce similar results in the other material examined. Similar effects were observed in pollen mother cells but in addition asynapsis occurred in some cases and in others the cells appeared to have become polyploid at the premeiotic stage. Pollen sterility was high and seed setting in the treated ears was poor.

2525 Swaminathan, M. S. & Natarajan, A. T.
Chromosome breakage induced by vegetable oils and edible fats.
Curr. Sci. 1956 : **25** : 382–84.
Chromosome and chromatid breakage, fragment formation and bridge formation were among the aberrations caused in seeds of *Triticum monococcum, T. dicoccum, T. aestivum, Oryza sativa* and *Vicia faba* by soaking in mustard, groundnut, castor, gingelly, coconut, linseed or hydrogenated groundnut oils, or in ghee. The greatest number of aberrations was found after treatment with groundnut and mustard oils and the maximum contraction of chromosomes after treatment with castor oil (cf. Abst. 2512).

2526 Craveri, R. & Veronesi, U.
The effect upon mitosis in *Allium cepa* of an antifungal antibiotic produced by *Streptomyces* sp.
Exp. Cell Res. 1956 : **11** : 560–67.
Antibiotic 757, produced by a species of *Streptomyces*, was found to cause marked retardation of root growth, the effect being intensified with increasing concentrations. Cytological examinations showed frequent chromosome aberrations, including stickiness and bridge formation and fragmentation. Other effects included spindle inactivation resulting in c-mitosis and inhibition of cell wall formation resulting in the production of binucleate cells.

2527 Payne, I. J.
Cytological analysis of ultra-violet irradiated *Escherichia coli*: I. Cytology of lysogenic *E. coli* and a non-lysogenic derivative. II. Ultraviolet induction of lysogenic *E. coli*. III. Reactions of a sensitive strain and its resistant mutants.
Diss. Abstr. 1956 : **16** : Publ. No. 17,257 : 1561–62.
Exposure to sublethal doses of ultraviolet radiation is said to result in the following sequence of changes: "(*a*) the chromosomes of the nuclei of irradiated cells coalesce slightly; (*b*) chromosomes of pairs of adjacent nuclei flow together into one mass so that, instead of 2 or 4 chromosomal clusters, there are 1 or 2 aggregated masses per cell; (*c*) further increase in chromatin due to chromosomal replication without nuclear or cytoplasmic division; (*d*) grouping of chromosomes; (*e*) segregation of chromosomes into haploid nuclei; (*f*) resumption

of cytokinesis." These changes were observed in all the strains studied, viz. lysogenic K12, nonlysogenic derivatives of K12, wild type B and mutants of B resistant to radiation or furacin. With the liberation of infective phage, the last three stages of recovery did not occur; chromosomal fragmentation and accumulation of chromatic material were instead observed. Treatment of B and its mutants with furacin or hypertonic sodium chloride resulted in changes similar to those described in the case of ultraviolet radiation. "The alteration in the configuration of chromatin appears to be a secondary consequence of the failure of a homeostatic mechanism regulating the internal ionic milieu. Inhibition of cell division appears also to be secondary to a primary injury."

2528 Swaminathan, M. S. & Natarajan, A. T.
Polyploidy and radiosensitivity.
Nature, Lond. 1957 : **179** : 479–80.

Dry seeds of *Triticum monococcum*, *T. dicoccum* and *T. aestivum* were exposed to 11,000 r. of X rays, and to fast neutrons of source strength $10^9 n_f/cm.^2/sec.$ over a 2π solid angle for 3 hours. The species were also treated with β rays, seeds being soaked in P^{32} solution for 24 hr., with a dose of $5\mu c.$ per seed. As shown by data on exchanges and deletions, the radiosensitivity per unit length of chromosome was (1) identical in all three species in the case of exposure to X rays, (2) identical in the diploid and tetraploid species but significantly different in *T. aestivum* upon treatment with P^{32} and (3) significantly different in all three species in the case of fast-neutron irradiation. Differences in rate of absorption of P^{32} may be a factor influencing the results obtained for β rays. The hexaploid and tetraploid species had a much greater number of breaks than could be accounted for by the total lengths of their chromosome complements.

2529 Wolff, S. & Luippold, H. E.
Inaccuracy of anaphase bridges as a measure of radiation-induced nuclear damage.
Nature, Lond. 1957 : **179** : 208–09.

A detailed report is given of investigations referred to in Abst. 1150.

2530 Tanaka, N.
(Spontaneous chromosome aberrations in the root-tip meristems of *Tradescantia paludosa*).
Senshokutai (Chromosome)/Kromosomo 1956 : No. 29 : 1010–19. [Japanese].

Studies of the monthly rate of spontaneous chromosome aberrations of *T. paludosa* in Japan in 1952–54 revealed that some of the variation in rate could be attributed to increased radiation due to meteorological causes or to the fall-out from atomic explosion.

2531 Montezuma-de-Carvalho, J.
X-ray experiments on mitosis. I. Analysis of chromosome changes in colchitetraploid X_2 cells.
Bol. Soc. broteria. 1956 : **30** : 221–40.

Root tips of *Vicia faba* were irradiated when the nuclei were at the resting stage and then treated with colchicine so that some of the cells undergoing second mitosis were tetraploid. Dicentrics, acentrics, sister reunion and chromatid interchange were observed in these cells. Spontaneous breakage, subchromatid breakage, deferred reunion and deferred breakage are discussed as possible causes of the sister reunion and chromatid interchange.

2532 Ono, H. & Nagai, S.
(Prevention of chromosome fragmentation in *Paraixeris denticulata* x *Crepidastrum keiskianum*).
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 224–27. [Japanese].

By applying an RNA solution to the flowers of the mother plant of the above hybrid combination just after fertilization, the chromosome fragmentation that habitually occurs in the hybrid can be prevented.

2533 Shult, E. E. & Lindegren, C. C.
Direct effect of preferential segregation on the origin of polysomy.
Nature, Lond. 1957 : **179** : p. 683.

Investigations on *Saccharomyces* have indicated that two nonhomologous chromosomes may undergo preferential segregation because of affinity between their centromeres. It is suggested that this type of preferential segregation may lead to aneuploidy in *Saccharomyces* and other organisms.

2534 Cole, K.
The effect of various trisomic conditions in *Datura stramonium* on crossability with other species.
Amer. J. Bot. 1956 : **43** : 794–801.

Crosses were made between several trisomic forms of *D. stramonium* and two lines of *D. ceratocaula* but only in the case of *D. stramonium* $2n + 17\text{–}17$ x *D. ceratocaula II* were embryos produced which could be grown to maturity. Tabulated data are given showing pollen germination, pollen-tube growth, capsule setting and

embryo formation in the trisomics after pollination by *D. ceratocaula I* and *II*. The two ends of the extra chromosome were found to have dissimilar effects on embryo production and in several crosses abnormal endosperm development was observed.

2535 Reimann-Philipp, R.
Die Erzeugung polyploider Formen von *Convallaria majalis* sowie einige Beobachtungen über die Wirkung der Maiblumenglykoside auf die Mitose. (**The production of polyploid forms of *C. majalis* and some observations on the effect of lily of the valley glycosides on mitosis**).
Z. Pflanzenz. 1956 : **36** : 289–304.

Growing shoots of *C. majalis* were injected with a 0·1% colchicine solution. Cytological studies in the following year revealed the existence of a mixture of tetraploid and diploid cells in a number of the plants that had been thus treated, the tetraploid cells predominating. It is suggested that the glycosides convallarin, convallatoxin and convallamarin, which are present in *C. majalis* and all of which are chemically similar to colchicine, may be able to induce polyploidy once some polyploid cells have been produced as the result of colchicine treatment. Cytological studies of the root-tip cells of germinating barley grains treated with convallamarin showed that this substance has a c-mitotic effect.

2536 Sakisaka, M.
(**Considerations on the connexion between the life form of plants and chromosome number**).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1951 : **64** : 93–98. [Japanese].

A positive correlation is noted between length of life span (annual or perennial) and chromosome number. Vegetative propagation is more characteristic of polyploids than diploids.

2537 Cortini, C.
Azione citogenetica di alcuni derivati della colchicina. (**Cytogenetic action of some colchicine derivatives**).
Caryologia 1956 : **9** : 1–18.

Colchicoside had a marked c-mitotic effect without toxicity and by renewing the solutions every 24–48 hours it was possible to produce 16*n* cells in *Allium cepa*. Deacetylcolchicine was similar in effect but slightly more toxic whereas demecolchicine was less effective and more toxic.

2538 Stapp, C.
Zellkerne und Kopulationsvorgänge bei Bakterien. (**Cell nuclei and conjugation processes in bacteria**).
Umschau 1957 : **57** : 206–08.

Observations on stained and living material of *Agrobacterium tumefaciens* are reported in which the rods are seen to clump together in star-like formations with their single flagella pointing outwards. Nuclear material in each rod moves towards the centre of the star and appears to fuse with that of the other rods. Subsequently the nuclear material becomes redistributed in the rods which then undergo division into smaller rods, each containing a portion of nuclear material.

2539 Kimura, K.
(**On diploidization by a doubly compatible dicaryotic mycelium in the Hymenomycetes**).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1954 : **67** : 238–42. [Japanese].

When a haploid strain (X) of *Coprinus macrorhizus* f. *microsporus* was inoculated with a dicaryotic strain in which one nucleus came from the same strain and the other from a strain (Y) from a different habitat, then nuclear conjugation was of the type XY. On repeating the inoculation in the second generation nuclear conjugation was of the type XX; in the third generation, there was a return to type XY. Thus, the type of nuclear conjugation alternated in the early successive generations but thereafter alternation ceased. It is surmised that the alternation is brought about by caryoplasmatic interactions.

2540 Abo El Dahab, M. & Cox, C. E.
Studies of certain nutritional requirements of chloromycetin-resistant, chloromycetin-susceptible, pathogenic, and nonpathogenic isolates of *Pseudomonas solanacearum*.
Phytopathology 1957 : **47** : p. 1 : (Abst.)

A difference has been found in respect of tolerance of chloromycetin between a strain of *Ps. solanacearum* isolated from tobacco and a second strain isolated from tomato. Strains showing varying degrees of resistance to the antibiotic were isolated from both original strains by prolonged incubation with chloromycetin and were found to show variations in nutritional requirements. No correlation was found between pathogenicity and chloromycetin resistance and no differences of nutritional

requirements were found between strains of differing pathogenicity.

2541 Poljakov, I. M., Dmitrieva, A. N. & Zdriljko, A. F.
(New facts on the use of radioactive isotopes in investigations of fertilization in plants).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1956 : **17** : 321–34. [Russian].

Physiological and biochemical observations on such plants as maize, cotton, tobacco and pea, which were supplementarily fertilized by pollen carrying the isotopes S^{35} and P^{32} after normal fertilization, are reported. The isotopes reached the ovary via the growing pollen tubes and the latter participated in metabolic exchange, in particular, in the formation of the seed. Most of the radioactive substances passed into the seed; a small fraction diffused along the style.

2542 Heilinger, F.
Die Sexualvorgänge bei *Bombardia lunata* Zckl. III. **(Sexual processes in *B. lunata* Zckl. III).**
Beitr. Biol. Pfl. 1957 : **33** : 164–76.

Strains of *B. lunata* belonging to reaction types A and a remained fully fertile when grown together on malt extract agar but cultures of either A or a grown in isolation on this medium gradually became female sterile, while retaining the ability to produce ♂ organs. It is postulated that chemical changes in the composition of the medium, probably due to oxidation, are responsible for this process. It was not found possible to restore the ♀ fertility of these strains and an analogy is drawn between the female-sterile strains of *B. lunata* here described and the female-sterile mutants of *Podospora anserina* isolated by Esser (cf. Abst. 108). It is suggested that fungi imperfecti may have evolved by losing their ability to reproduce sexually in much the same way as observed in these two experiments with *B. lunata* and *P. anserina.*

2543 Hershey, A. D. & Melechen, N. E.
Synthesis of phage-precursor nucleic acid in the presence of chloramphenicol.
Virology 1957 : **3** : 207–36.

Studies of the formation of phage precursor of phage T2H in *Escherichia coli* 'H' in the presence of chloramphenicol show that the bulk of the phage-precursor nucleic acid is not formed inside particles possessing a phage-precursor protein membrane (cf. Abst. 136).

2544 Linskens, H. F. & Esser, K.
Über eine spezifische Anfärbung der Pollenschläuche im Griffel und die Zahl der Kallosepfropfen nach Selbstung und Fremdung. **(On a specific coloration of the pollen tubes in the style and the number of callus plugs after selfing and cross pollination).**
Naturwissenschaften 1957 : **44** : p. 16.

A method is described by which the growth of pollen tubes in the style can be traced by means of fluorescent staining. It was shown that the formation of callus plugs in the pollen tubes of selfed petunias is twice as frequent as in cross-pollinated plants. It is concluded that the self-sterility mechanism between pollen tube and style is partly due to the fact that larger amounts of glucose and carbohydrates are deposited in calluses in selfed plants.

2545 Berg, P. L.
(Standardizing selection in evolution of the flower).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 318–34. [Russian].

Measurements of various organs showed that variation was less in the floral organs than in the stems and leaves, and in species such as *Digitalis purpurea* or *Nicotiana alata*, with flowers closely adapted to insect pollinators, the dimensions of the flowers were less variable than in those of less specialized species. The reduced variability was particularly evident in the tubular parts of the flowers, the dimensions of which were, moreover, not correlated with those of the rest of the flower or of the vegetative organs. This situation is clearly a result of natural selection and the process by which it arises is termed "standardizing selection", which is envisaged as a particular category of stabilizing selection.

2546 Haccius, B.
Über die Regenerationsfähigkeit junger Embryonen von *Eranthis hiemalis* nach Colchicin-Behandlung. **(On the regenerative ability of young embryos of *E. hiemalis* after colchicine treatment).**
Naturwissenschaften 1957 : **44** : 18–19.

Seeds of *E. hiemalis* were soaked in a 0·5–1% colchicine solution for five days prior to sowing. The development of the embryos was inhibited as the result of the colchicine treatment and in many cases the embryos degenerated after a short time. In a few instances, however, a new embryo was formed at the base of the root.

Similar results were obtained by treating seeds of this species with several other chemicals, including nitrogen mustard and maleic hydrazide.

2547 Srivastava, R. K.
The evolutionary concept of the morphology of endosperm.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1953 : **66** : 88–97.
The morphological and cytological status of the endosperm is reviewed. The constancy of physiological function of the endosperm is contrasted with the very wide range in chromosomal constitution which occurs.

2548 Kovalev, N. V.
(The question of splitting species).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 855–57. [Russian].
The author protests against recent splitting of species such as *Vitis vinifera* and many other horticultural species and some principles are enunciated for guidance in the establishment of new species.

ECONOMIC LOWER PLANTS

2549 Wieringa, K. T. & Bakhuis, J. A.
Chromatography as a means of selecting effective strains of *Rhizobia*.
Plant & Soil 1957 : **8** : 254–62.
A method is described, involving chromatographic analysis of the sap of pea plants, by means of which it is possible to select effective strains of *Rhizobium* within three weeks after inoculation. The sap of plants inoculated with effective strains was found to contain aspartic acid, asparagine, glutamine, hydroxyproline and threonine while that from uninoculated plants or plants inoculated with ineffective strains contained only aspartic acid. The presence of asparagine is recommended as a reliable indicator for effective strains.

2550 Shimwell, J. L.
The true significance of Hoyer's medium in the differentiation of *Acetobacter* species.
J. Inst. Brew. 1957 : **63** : 44–45.
"It is shown that inability of most *Acetobacter* spp. to grow on Hoyer's medium is not necessarily due to an inability to utilize an ammonium salt as sole source of nitrogen. It is indeed, more often due to inability to utilize ethyl alcohol as sole source of carbon."
[Author's summary].

2551 Shimwell, J. L.
A pattern of evolution in the genus *Acetobacter*.
J. Inst. Brew. 1957 : **63** : 45–56.
Further study of variants of *Acetobacter* spp. suggests that the numerous species described in the literature are mutants of only one or two parental species (cf. Abst. 113).

2552 Silber, A. & Bischoff, W.
Die Konstanz des Alkaloidgehaltes bei verschiedenen Rassen von Mutterkorn. **(The constancy of the alkaloid content of different races of ergot).**
Pharmazie 1954 : **9** : 46–61.
A cultured race of *Claviceps purpurea* showed a constant mean alkaloid content although the range of variation among individual sclerotia was appreciable. Environment had little effect on alkaloid content. Wild material was heterogeneous, but single sclerotia gave strains showing constant differences in alkaloid content, indicating that the character is genetically determined.

2553 Santa María Ledochowski, J.
***Hansenula matritensis*, nov. spec.**
An. Inst. nac. Invest. agron., Madr. 1956 : **5** : 151–62.
The new species described from Madrid is characterized by its capacity to ferment sucrose at both high and low concentrations.

2554 Ravinovič, Z. D.
(The selection of rough variants of champagne yeasts in industry).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1956 : No. **7** : 13–18. [Russian].
Selection of *Saccharomyces ellipsoideus* strains tolerant of acidity is described.

2555 Jankun, A.
Wyosobnienie i zbadanie szczepu drożdży "Brusznica 7". **(The selection and testing of the yeast strain Brusznica 7).**
Acta Microbiol. Polon. 1956 : **5** : p. 303.
A new yeast strain, Brusznica 7 [Cowberry 7], suitable for fermentation of fruit juices, has been selected at Kraków.

2556 Bočarov, S. N. & Bakušinskaja, O. A.
(Testing hybrid strains of baking yeasts).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1956 : No. 23 : 360–66. [Russian].
Strain 39s and 70 from the USSR Institute of Genetics were more active and multiplied more actively than Tomsk VII.

2557 Bočarov, S. N.
(Hybridization of industrial yeast strains. Second report).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1956 : No. 23 : 341–51. [Russian].
A number of new strains have been obtained by hybridization since 1954 (cf. *PBA*, XXVI, Abst. 2032). Some of these multiply more rapidly than all the initial industrial strains.

2558 Thyagarajan, T. R.
Some observations on the living cells of *Saccharomyces carlsbergensis* from twenty four-hour agar slants with phase contrast and dark ground illumination.
Proc. Indian Acad. Sci. Sect. B. : 1956 : **44** : 278–88.
Although the nucleus was not visible in living cells, it was revealed in cells fixed in dilute Lugol's solution as a structure situated outside the vacuole.

2559 Kosikov, K. V. & Raevskaja, O. G.
(Adaptation of the yeast *Saccharomyces paradoxus* to fermenting simple dextrins in malt wort).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1956 : No. 23 : 326–40. [Russian].
Strains of *S. paradoxus* capable of fermenting simple dextrins were obtained by culturing upon the above substrate.

2560 Fang, S. F., Tang, P. S., Tsai, C. K. & Wu, C. F.
Induced adaptations in yeast. Growth, respiratory and fermentation characteristics of yeast adapted to high temperature.
Sci. sin. 1956 : **5** : 239–52.
By prolonged incubation at 40° C., strains of *Saccharomyces formosensis* '2–119' and *S. ellipsoideus* '2–346' have been obtained which are able to ferment at this temperature.

2561 Minagawa, T., Yanagishima, N., Arakatsu, Y., Nagasaki, S. & Ashida, J.
Studies on the adaptation of yeast to copper. II. The yeast nucleic acid fraction counteracting the inhibition of yeast growth by copper.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1951 : **64** : 65–73.
The extract from cells of a strain of *Saccharomyces ellipsoideus* that had become adapted to grow in the presence of copper conferred resistance to copper on the unadapted mother strain. The active principle appeared to be RNA.

2562 Minagawa, T., Yanagishima, N., Arakatsu, Y., Nagasaki, S. & Ashida, J.
On the adaptation of yeast to copper. III. Further studies on the ribonucleic acid from the copper resistant yeast cells.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1952 : **65** : 228–31.
Further to the research summarized in Abst. 2561 the authors confirmed that the substance responsible for conferring resistance to copper is RNA. However, its activity is not impaired by heating to 100° C. for 1 hr.

2563 Minagawa, T., Yanagishima, N., Arakatsu, Y., Nagasaki, S. & Ashida, J.
On the adaptation of yeast to copper. IV. Species specificity of the ribonucleic acid.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1953 : **66** : 9–17.
RNA extracts from copper-resistant yeasts other than *Saccharomyces ellipsoideus* do not confer copper resistance to unadapted strains of *S. ellipsoideus* (cf. Absts. 2561–2).

2564 Vega, R.
Contribución al estudio zimotécnico del Departamento San Rafael. **(Contribution to the study of the yeasts of the department of San Rafael).**
Bol. téc. Fac. Cienc. agrar. Univ. Cuyo 1955 : No. 16 : Pp. 76.
A general review is given of the use of selected strains of yeasts in wine making in Argentina. Samples of yeasts taken from grapes in different parts of the province of Mendoza were analysed and details are given of the morphological characteristics of the strains isolated, of their behaviour in grape and malt musts, spore production, fermentation capacities and resistance to SO_2. Analyses were made of the wine produced from each strain; three of the 28 strains produced wines classed as excellent, one of them aromatic, and superior to those from any imported yeast.
On classification of the 28 strains it was found that 15 of them belonged to *Saccharomyces cerevisiae* var. *ellipsoideus*, 2 to *Debaryomyces*, 1 to *Candida*, 2 to *Hansenula* and 1 each to *Pichia fermentans*, *Schwanniomyces*, *Kloeckera*, *Saccharomyces fermentati*, *S. rouxii*, *S. ludwigii*, *S. willianus* and *Torulopsis*.

2565 VEGA, R.
Cantidad de alcohol, glicerina y acidez volátil producida por distintas levaduras. **(Quantity of alcohol, glycerine and volatile acids produced by different yeasts).**
Bol. téc. Fac. Cienc. agrar. Univ. Cuyo 1955 : No. 15 : Pp. 31.

The proportion of these products of fermentation, all of which affect the quality of the resulting wine, is shown to vary according to the strain of yeast used. Experiments in which the 28 strains referred to in Abst. 2564, together with four others, were used to ferment grape must, showed that those belonging to *Saccharomyces cerevisiae* var. *ellipsoideus* produced the greatest quantity of alcohol and gave rise to wine with the best quality and aroma, the alcohol content varying from 12·675 to 13·275%. Certain races gave high alcohol contents but low quality. The glycerine produced per 100 g. of sugar varied from 3·3 g. to 4·7 g. and the volatile acid from 0·16 g. to 0·60 g. according to the race of *S. cerevisiae* var. *ellipsoideus* used, the variation being much greater when other species and genera were taken into consideration.

CROP PLANTS

2566 **Atom rays and plant breeding.**
The Book of Dunns Farm Seeds, Salisbury 1957 : 3–5.

T. J. Jenkin contributes a general discussion of the use of induced polyploidy and induced mutations in plant breeding and H. J. M. Bowen describes the various methods of producing induced mutations available at Harwell. T. Davies describes work carried out at the Guiness Barley Research Station at Warminster with X-irradiated Spratt Archer barley. A number of mutant plants are under observation, including some with an erect-leaved habit, some with short straw and some ripening earlier than the parent variety.

2567 MEHTA, T. R.
The genotype in agriculture.
Indian J. Genet. 1956 : **16** : 1–7.

The importance of genotypic variation is discussed with particular reference to breeding for disease resistance, races of pathogenic fungi and acclimatization of introduced species.

2568 **Colonial Research 1955-56. Annual Report of the Colonial Research Council, London 1956** : Pp. 312.

Brief accounts are included in this report of projects being carried out, in the countries served by the Colonial Research Council of the British Commonwealth, in the fields of crop selection and breeding. Most of the work referred to has already been summarized in *Plant Breeding Abstracts* from other sources.

2569 DE HAAN, H.
Periodicals in the field of research on plant breeding.
Euphytica, Wageningen 1956 : **5** : 353–56.

A revised survey is given of the chief journals published in Europe, India and the USSR for the use of plant breeders and geneticists (cf. *PBA*, XXII, Abst. 2560).

2570 TALLARICO, G.
I progressi ed i miracoli della ibridazione od eterosi. **(Advances and miracles of hybridization or heterosis).**
Riv. internaz. Agric. 1956 : **1** : No. 7 : 55–57.

The use of hybridization, heterosis, polyploidy and induced mutations to increase food production is discussed, with examples, in this popular article.

Transactions of the Royal Highland and Agricultural Society of Scotland 1955 (1956) : **67** : Pp. 318 + 42.

2571 *Scottish Plant Breeding Station. (pp. 63–66).*

Breeding work on *Brassica* root and fodder crops and on sugar beet is the activity chosen for review.

Swede. The possibilities of inbreeding have been extensively explored. A high degree of uniformity in respect of many characters has been secured but this may be accompanied by loss in vigour. F_1 hybrids between unrelated lines have markedly large roots but no practical means of producing hybrid seed has so far been found. By various methods of propagation, it is hoped to build up high-yielding strains with a high degree of uniformity. Self-incompatible stocks are being developed. Selection for club-root resistance is also being carried out but little progress has been achieved in producing resistant lines; the possibility of introducing a different form of resistance by hybridization is under consideration.

Sugar beet. Selection of nonbolting types for early sowing continues. The first potential commercial strain, derived from bolting-resistant material supplied by the Cambridge Plant Breeding Institute, is now beyond the preliminary stage of development.

Rape. Improvements envisaged in *Brassica napus* include prolongation of the season of use and resistance to club root; possible ways of

transferring desirable characters from the kales by indirect interspecific crosses are discussed.

Kale. Derivatives of crosses of thousand-headed kale with broccoli have been selected for yield and time of maturity; short-stemmed lines have not as a rule surpassed normal types in weight of leaves. Attempts were also made to select a short-stemmed, leafy type resembling marrow-stem kale from crosses between thousand-headed kale and kohl rabi; a triple cross including broccoli was also made.

2572 **The Research and Experimental Record of the Ministry of Agriculture, Northern Ireland 1954** (1956) : **4** : Pp. 138.

Brief reports are included of trials of varieties of oats, barley, ryegrass, potato, sugar beet, Brussels sprout and tomatoes. Breeding has been carried out with the following crop plants.

Oats. Breeding for increased lodging resistance, improved yield and grain quality, resistance to *Erysiphe graminis* and tolerance of manganese deficiency has continued. Back crosses have been made to their susceptible parents of F_1 plants from crosses between Sun II, Stormont Arrow and Stormont Iris and American varieties resistant to *E. graminis*.

Observations on reaction to manganese deficiency have been made on a collection of 168 varieties.

In the rod row trial of 17 homozygous lines selected from Stormont Arrow x Elder the calculated value of F in the analysis of variance did not permit the use of the t test to establish significant differences. A number of selections were markedly later in lodging than either the parents or Sun II.

Lolium. Several polycross and other trials have been laid out, from which it is hoped to obtain information on pollination and on methods of evaluation of selected plants.

Potato. Crosses have been made between *Solanum andigenum* and *S. tuberosum* with a view to developing lines resistant to *Heterodera rostochiensis*.

In a survey of the races of *Phytophthora infestans* occurring in Northern Ireland, race 4 was found to predominate. Breeding for resistance to *Ph. infestans* has continued, resistant seedlings being retained for further trials.

Progress has been made in the establishment of foundation stocks of different varieties free from virus diseases. The reactions of Ulster Dale and three promising seedlings to viruses X, A and B have been investigated by grafting infected scions on to them.

Flax. The back cross programme of breeding for resistance to *Polyspora lini* is nearing completion. Further crosses have been made with a view to improving resistance to other diseases and to lodging.

In an attempt to produce a variety with combined resistance to several diseases, crosses have been made between Tekstiljščik (Textile-worker), resistant to *Melampsora lini*, and La Plata, an oil variety resistant to *P. lini*, *Colletotrichum linicola* and *Phoma* sp. as well as to *M. lini*. Back crosses have been made to the fibre parent for several years, progeny resistant to *P. lini* being selected for breeding.

Preliminary results suggest the existence of physiological races of *P. lini*.

From 38 collections of *M. lini* from Northern Ireland, England, Scotland, Wales and Pakistan 17 races have been distinguished including nine not previously described. In greenhouse tests all fibre varieties commonly grown in the United Kingdom were susceptible to all the races isolated but some of the imported varieties, including Tekstiljščik, Stahanovec [Stahanovite], Wada 1288/12 and USSR2 (ex Dugejheshchya) were immune or highly resistant. However in field trials these varieties did not continue to show immunity or marked resistance, suggesting that more races of the fungus were present in the field than in the greenhouse trials. Many varieties which were susceptible if inoculated before flowering proved to be resistant if inoculated after flowering.

A detailed report is given of a varietal trial including two new Dutch varieties.

Twenty-fifth Annual Report of the Minister for Agriculture, Dublin 1955–56 : Pp. 163 + 81.

2573 *Special technical and advisory work. Seed propagation division.* (*pp.* 64–66).

Wheat. An epidemic of stem rust provided the opportunity of making selections for resistance at the Cereal Station, Ballinacurra.

Oats. Selections of Sun II x Bonstar, Bonstar x Potato, Eagle x Bonstar, Beaver x Potato and Sun II x Triumph are being developed.

Barley. Selections of the same parentage as the standard malting variety Beorna (cf. *PBA*, XXVI, Abst. 2234) were studied. Crosses were made between varieties such as Herta, Ymer and Carlsberg. X irradiation has resulted in XC–11, a variety with "unusual grain characteristics". Since it gives low yields, the main use of the type will be as a parent in crosses with barleys producing high yields. Mutants of possible economic value have been induced by

neutron treatments effected at the Atomic Energy Research Establishment, Harwell, England. In a large-scale trial Spratt-Archer x Kenia 17/8 compared favourably in yield with Proctor (cf. *PBA*, XXIII, Abst. 1180).

Potato. Hybridization was carried out at Dungorman, Co. Donegal.

2574 *Report of the Agricultural Department, University College, Dublin, for the year* 1955–56. (*pp.* [*1*]–[*18*]).

Wheat. The yellow-rust resistance of the winter wheat Glasnevin Rosa broke down in 1954, presumably as the result of attack by a new race; a completely resistant selection of this variety has since been obtained. Among recently developed winter-wheat hybrids, derivatives of crosses of Glasnevin Rosa with Minister and Pajbjerg showed most Promise. The spring wheats Glasnevin Rosa x Kärn [Kernel] 1 and 3 have given high yields over the past three years.

Barley. Promising material developed includes selections of Kärn x Spratt-Archer 37/3, Glasnevin 1 x Herta, Glasnevin 22 x Herta and [(Spratt-Archer-Kenia 6/3) x Spratt-Archer 37/5] x Glasnevin 5.

Forage crops. Breeding of perennial ryegrass, timothy and red clover continued (cf. *PBA*, XXVI, Abst. 3060).

Brussels sprouts. Progress was made in breeding a variety for the fresh market. Suitability for freezing is also receiving attention.

Tomato. In breeding for resistance to *Cladosporium* leaf mould two difficulties have been encountered: the occurrence of a serious genetical leaf-spot necrosis in the hybrid strains used (origin not given) and linkage between small fruits and resistance.

2575 Howard, H. W.
Crops and plant breeding.
J. R. agric. Soc. 1956 : **117** : 99–112.

A survey is given of recent work in Great Britain on cereals, potatoes, sugar beet and forage crops and the discussion held by the Royal Society on hybrid vigour is reviewed (cf. *PBA*, XXVI, Absts. 35–44).

2576 Das Institut für Kulturpflanzenforschung in Jahre 1955. (**The Institute for Research on Crop Plants in the year 1955**).
Kulturpflanze, Berlin 1956 : No. 4 : 5–26.

The work of the Department of Genetics and Cytology during 1955 is outlined briefly. Studies on the induction of mutations and on monogenically and digenically determined heterosis in *Antirrhinum* were continued; it was shown that the manifestation of heterosis in *Antirrhinum* is strongly influenced by environmental conditions, in particular by the amount of sunshine in the first two months of growth. Studies were also carried out on hybrid vigour in tomatoes, on mutants of *Lycopersicon esculentum* and *L. pimpinellifolium* and on the systematics of the genus *Lycopersicon* (cf. *PBA*, XXVI, Abst. 1883) and of *Lactuca sativa* (cf. *PBA*, XXVI, Abst. 2895). Economically valuable mutants of winter and spring barley were obtained by X irradiation (cf. *PBA*, XXVI, Abst. 2333 and XXVII, Abst. 2974) and studies were made of temperature-conditioned chromosome segmentation in barley (cf. *PBA*, XXVI, Abst. 2331). Experiments were also carried out on interspecific hybridization within the genus *Cucurbita* (cf. *PBA*, XXVI, Abst. 2900) and on the induction of mutations in *Nicotiana* spp. and *Datura* spp. (cf. *PBA*, XXV, Abst. 3339). A wide range of barley varieties were tested for resistance to *Erysiphe graminis* (cf. *PBA*, XXVI, Abst. 2337 and XXVII, Abst. 2982) and studies were made on the conversion of winter wheats into spring wheats (cf. *PBA*, XXVI, Abst. 1146). Mutants of soya bean were obtained by X irradiation.

Jahrbuch 1955 der Bundesanstalt für Pflanzenbau und Samenprüfung in Wien. (**1955 year book of the Federal Institute for Plant Cultivation and Seed Testing, Vienna**).
Bodenkultur 1956 : **7**. Sonderheft : Pp. 184.

2577 *Nietsch, H. Botanische Sortenbeschreibungen.* (*Botanical descriptions of varieties*). (*pp. 60–76*).

Comprehensive data are provided on morphological characteristics of the principal varieties of potatoes and oats grown in Austria. Each of the varieties described is illustrated.

2578 *Meinx, R. Die Winterhärteprüfung von Winterweizen.* (*Testing the winter hardiness of winter wheats*). (*pp. 77–86*).

Tabulated data are presented on the comparative winter hardiness of some 50 varieties of winter wheat grown in Austria. The varieties were tested in the open under conditions of heavy snow and in laboratory freezing experiments.

2579 *Zsoldos, J. Mais-Sortenversuche* 1955. (*Maize variety trials*, 1955). (*pp. 107–15*).

The results are presented of trials of 33 Austrian, American, Hungarian, Yugoslav and Dutch maize varieties and hybrids tested at a number of centres throughout Austria in 1955.

2580 *Demel, J. Neun Jahre Prüfung holländischer Kartoffelsorten.* (*Nine years' trials of Dutch potato varieties*). (*pp. 116–33*).
Information is given on the yield, disease resistance, maturity, average size of the tubers and starch content of 22 Dutch varieties tested in Austria during 1947–1955.

2581 *Graf, A. Eine Sortenstudie bei Futterrüben. Beziehung zwischen Ertragsleistungen und Cercosporaanfälligkeit.* (*A varietal study of mangels. Relationship between yield performance and susceptibility to* Cercospora). (*pp. 138–50*).
Of 14 mangels tested under conditions of heavy infestation, the resistant varieties Zentaur [Centaur], Rosa Beta and Ovana gave the highest yields of dry matter.

2582 Zusammenfassung 1955 mehrjähriger Versuchsergebnisse von Getreide, Mais, Kartoffeln, Rüben, Luzerne. (**Summary of the results of several years' trials of cereals, maize, potatoes, beets and lucerne, 1955**).
Bundesanst. Pflbau. Samenprüf., Wien 1956 : Pp. 24.
The results of varietal trials of the above crops at different centres in Austria in the period 1950–54 are summarized in tabular form.

2583 Sedlmayr, K.
A micsurini biológia és a magyar növénynemesítés. (**Mičurinst biology and Hungarian plant breeding**).
Agrártudomány 1955 : **7** : 443–48.
Some results of Hungarian plant breeding during 1950–55 are discussed in the light of Mičurinist theories.
A list of crop varieties maintained in the recently established varietal collection at Martonvásár was published in 1955.
By means of artificial pollination and free selective hybridization, new varieties have been bred, such as the hybrid maize Mv.5, the sugar beet Beta K–91 and the mangel Rosa Beta, all of which surpass previous varieties in yield and vigour. A new high-yielding hemp variety, Kompolt B–7, with high fibre content and good quality, has been produced by wide hybridization involving a Chinese variety as female parent. The new polyploid sugar-beet hybrids have proved resistant to *Cercospora* in the USA and China as well as in Hungary. The production of flax resistant to *Colletotrichum* and *Septoria* is being attempted by means of hybridization with resistant varieties. New methods which facilitate selection have been developed for testing for quality in wheat, sugar beet and flax. Great stress is laid on the directed training of hybrids and on rapid seed production.

Nemesített növényfajtákkal végzett országos fajtakísérletek eredményei 1954. (**The results of completed national varietal trials of improved crop varieties, 1954**).
Országos Növényfajtakísérleti Intézet, Budapest 1955 : Pp. 336.

2584 *Horváth, A. & Sváb, J. A fajtakísérletek módszerei.* (*Methods of variety tests*). (*pp. 54–65*).
Further information is given on the technique of analysis of difference referred to in *PBA*, XXVI, Absts. 1943 and 2973, and on its application to sugar-beet trials.

2585 *Komlóssy, Gy. & Hinfner, K. Fajtarezisztencia-kutatások fontosabb eredményei.* (*Some important results of investigations on varietal resistance*). (*pp. 66–84*).
This paper is made up of two contributions by the first author on internal rust spot of potato and on the etiology of *Nigrospora oryzae* in maize, respectively, and three by the second author on internal blackening of the tubers, the occurrence of *Ditylenchus destructor* in potato and a method of evaluating disease resistance by assessing the degree of infection in individual potato tubers. Intervarietal differences in susceptibility to internal rust spot and darkening of the flesh were observed, the latter disorder being more frequent in varieties with a high starch content than in those poor in starch. Environmental conditions also had a marked influence on the incidence of the two disorders. None of the 36 varieties tested was immune or resistant to *D. destructor*.

2586 *Papp, Zs. Őszi búza* (Triticum aestivum *f.* hybernum *L.*). [*Winter wheat* (T. aestivum *f.* hybernum *L.*)]. (*pp. 85–101*).
In the 1954 tests involving 17 varieties, nine of which were new, Kompolt F169 and Kompolt B67, both selected from F481, gave the highest yields, had a short vegetation period rendering them less liable to rust attack and showed improved lodging resistance but were unsatisfactory in flour quality.

2587 *Horváth, P. Rizs* (Oryza sativa *L.*). [*Rice* (O. sativa *L.*)]. (*pp. 102–05*).
Data are given on the results of preliminary trials, carried out in 1952–54, of eight Hungarian strains and two introduced varieties.

2588 *Csák, Z. Burgonya* (Solanum tuberosum *L.*). [*Potato* (S. tuberosum *L.*)]. (*pp. 106–44*).

Details are given of the yields and starch contents of four early, eight midearly, 16 midlate and eight late varieties tested in 1954 at 13 stations.

2589 *Horváth, A. Cukorrépa* (Beta vulgaris *v.* saccharifera *Alef.*) [*Sugar beet* (B. vulgaris *v.* saccharifera *Alef*)]. (*pp. 145–65*).

Of 14 varieties tested at nine stations in 1954, the polyploids Beta Poly 1 and Beta Poly 3 gave higher yields of roots and of sugar than the other sugar beets, had higher ash contents and showed greater resistance to *Cercospora.*

2590 *Bakos, Zs. Kender* (Cannabis sativa *L.*) [*Hemp* (C. sativa *L.*)]. (*pp. 167–90*).

Of seven varieties tested in 1953 and 12 in 1954, the hybrid B7 developed at Kompolt from Kínai Mondzsu [Chinese Mondzsu] ♀ x Kompolt Fleischmann (cf. *PBA*, XXVI, Abst. 2642) was best in yield of stalks and fibre percentage and had good technological properties. Hungarian strains selected from Italian material also did well.

2591 *Papp, Zs. Fehér csillagfürt* (Lupinus albus *L.*). [*White lupin* (L. albus *L.*)]. (*pp. 191–97*).

Although inferior in yield to bitter varieties, the new sweet white lupin Kisvárdai fehér édes [Kisvárda Sweet White], due to be registered in 1955, has exceeded five other sweet varieties in yield of both seed and hay in tests conducted in 1952–54.

2592 *Taróczi, H. Szántóföldi herefélék.* (*Forage legumes*). (*pp. 198–214*).

Two new red clovers, the hybrid variety Fertöd M bred from native and introduced material and the polycross variety Táplánszentkereszt developed from strains of a land race from the Vas region of Hungary, differed little from current varieties in yield but exceeded them in winter hardiness, aftermath growth and resistance to fungous diseases.

Kompolt, a polycross sainfoin derived from a population of F perzso [F Persian], has given 6·8–9·7% higher yields of green matter than commercial varieties.

2593 *Komjáti, I. Borsó* (Pisum sativum *L.*). [*Pea* (P. sativum *L.*)]. (*pp. 215–76*).

In tests of 12 shelling and fodder peas, carried out during 1952–54, varieties of medium growth period gave the highest yield, the Hungarian pea Ujmajori korai Viktoria [Ujmajor Early Victoria] being best in both yield and 1000-grain weight.

Data are also presented on the results of yield and quality tests of 25 garden peas, together with information on the best varieties to grow for different purposes.

2594 *Komjáti, I. Csemegepaprika* (Capsicum annuum *L.*). [*Red pepper* (C. annuum *L.*)]. (*pp. 277–98*).

Information is provided on the yields of 16 table varieties tested at eight localities during 1952–54, together with data on their growth period and the colour, form, size, flavour, pungency, consistency and vitamin C content of the fruits. The new non-pungent selection Cecei édes 3 [Cece Sweet 3] from the Cece land race has pendent fruits and has proved early, productive and of high quality both for canning and for direct marketing. The erect-fruited sister varieties Cecei édes 12 and 16 are later and more demanding in their growth requirements.

2595 *Gábriel, A., Komjáti, I. & Vigh, L. Sárgarépa előkísérlet* (Daucus carota *L.*). [*Preliminary trial of carrot* (D. carota *L.*)]. (*pp. 300–12*).

Variety trials of 11 varieties tested at various stations during 1952–53 are reported.

2596 *Komjáti, I. & Vigh, L. Uborka* (Cucumis sativus *L.*). [*Cucumber* (C. sativus *L.*)]. (*pp. 314–35*).

Information is given on the performance of varieties with fruits of different lengths, tested at eight stations during 1952–54.

Nemesített növényfajtákkal végzett országos fajtakísérletek eredményei 1955. **(The results of completed national varietal trials of improved crop varieties, 1955).**
Országos Növényfajtakísérleti Intézet, Budapest 1957 : Pp. 441.

2597 *Horváth, A. & Sváb, J. Fajtakisérletek modszerei.* (*Methods of variety tests*). (*pp. 67–80*).

Further extensions are made to the technique of analysis of difference as referred to in Abst. 2584. A comparison between a wheat trial laid out in randomized blocks and subjected to the usual analysis of variance and the authors' technique in which the differences are not squared is stated to show that the two methods give similar results.

2598 *Komlóssy, Gy. A lenbetegségek hazai elterjedésével és a fajták rezisztenciakérdésével kapcsolatos vizsgálatok.* (*Investigations on the incidence of flax diseases in Hungary and on the problem of varietal resistance*). (*pp. 81–94*).

Information is given on the incidence of *Colletotrichum lini*, *Septoria linicola* and *Polyspora lini* and resistant and susceptible varieties are noted. In assessing resistance an infection index is used based on both the proportion of diseased plants in the population and the degree of infection shown by individual plants.

2599 *Hinfner, K. A burgonyafajták rezisztenciavizsgálatának eredményei az 1953–55. évi országos kísérletek alapján.* (*The results of investigations on the resistance of potato varieties on the basis of the 1953–55 national trials*). (*pp. 95–126*).

The reactions of 36 varieties to viral, bacterial and fungal diseases are described.

2600 *Papp, Zs. Rozs* (Secale cereale *L.*). [*Rye* (S. cereale *L.*)]. (*pp. 131–43*).

The results of trials of five varieties in different areas in 1954–55 are presented.

2601 *Taróczi, H. & Kelemen, I. Kukorica* (Zea Mays *L.*). [*Maize* (Z. mays *L.*)]. (*pp. 144–83*).

Details are provided on the performance of 16 hybrids and varieties tested at 15 stations in 1954 and 15 tested at 18 stations in 1955. The productive interinbred hybrids Mv5 and Mv26 were adapted throughout Hungary while Mv1 did best in the south. Óvár 1 (Mindszentpusztai fehér [Mindszentpuszta White] x Martonvásár FB) was the best intervarietal hybrid.

2602 *Csák, Z. Burgonya* (Solanum tuberosum *L.*). [*Potato* (S. tuberosum *L.*)]. (*pp. 184–240*).

Data are given on the yields, starch content, crude protein content and vitamin C content of four early, eight midearly, 16 midlate and eight late varieties tested at 13 stations during 1953–55.

2603 *Horváth, A. Cukorrépa* (Beta vulgaris *v.* saccharifera *Alef.*). [*Sugar beet* (B. vulgaris *var.* saccharifera *Alef.*)]. (*pp. 241–63*).

The polyploid varieties Beta Poly 1 and 2 again gave outstanding yields in the 1955 trials (cf. Abst. 2589).

2604 *Bakos, Zs. Len* (Linum usitatissimum *L.*). [*Flax* (L. usitatissumum *L.*)]. (*pp. 264–95*).

In linseed trials conducted at various stations during 1952–54, Szeged (Alfa) yielded most oil but was susceptible to spring frosts. Szerep (Hosszúhát N), although less productive, was more resistant to frost and drought.

Of the fibre varieties tested during 1953–55, Martonvásár Ib413 gave the highest yields but was inferior in fibre quality to the somewhat lower-yielding Soviet variety Prjadiljščik [Spinner].

2605 *Székács, J. Olaszperje* (Lolium italicum *L.*). [*Italian ryegrass* (L. italicum *L.*)]. (*pp. 296–302*).

Detailed information on the performance of one commercial and two improved strains tested at four stations during 1954–55 is presented. Intervarietal differences were slight.

2606 *Komjáti, I. Fűszerpaprika* (Capsicum annuum *L.*). [*Red pepper for seasoning* (C. annuum *L.*)]. (*pp. 303–36*).

As a result of trials carried out in 1952–54, the following four seasoning varieties are provisionally recommended: Szegedi nem csípős 47–25 [Szeged Nonpungent 47–25], which has given steady high yields in the Szeged area and has a high content of pigment; Szegedi nem csípős 47–137, which is high yielding and drought resistant but has a low pigment content; and Várszegi nem csípős I and Dokomlási nem csípős 2710, both of which proved highly productive in the Kolocsa area and had high contents of pigment.

2607 *Komjáti, I. Bokorbab* (Phaseolus vulgaris *L. var.* nanus *Mart.*). [*Dwarf bean* (Ph. vulgaris *L. var.* nanus *Mart.*)]. (*pp. 327–73*).

In tests carried out during 1953–54, the midearly variety Aranyeső [Golden Rain] and the late, large-podded variety Gödöllő were the most productive of 16 yellow-podded varieties and were resistant to diseases and suitable for canning. The latter variety is provisionally recommended. Of 12 green podded beans, Cardinal (Wachs Ideal x Long Tom) gave the highest yields and was disease resistant and of good canning quality; it, too, has been provisionally recommended. Kompolti gyöngybab [Kompolt Pearl bean] was the best of eight dry table beans in respect of uniformity of maturity and pod size, reliability of yield and time required for cooking.

2608 *Komjáti, I. Paradicsom* (Solanum lycopersicum *L.*). [*Tomato* (S. lycopersicum *L.*)]. (*pp. 374–95*).

Of 14 varieties tested in 1954–55 the small-fruited variety Korai csemege [Early Delicacy] gave the highest yield and was widely adapted. Kecskemét 42, with medium-sized fruits, was early, productive and of good canning quality. Kecskemét 363 was the best of the large-fruited canning varieties.

2609 *Vigh, L. Cukordinnye* (Cucumis melo *L.*). [*Melon* (C. melo *L.*)]. (*pp. 396–409*).

Information is given on the earliness, yield, flavour and suitability for transport of nine varieties tested during 1953–55. In nearly all the varieties, female flowers which proved to be hermaphrodite with fully fertile pollen were found. Self pollination is thought to be frequent.

2610 *Vigh, L. Görögdinnye* (Colocynthus citrullus (*L*) *O. Kae*). [*Water melon* (C. citrullus (*L*) *O. Kae*)]. (*pp. 410–20*).

In trials conducted in 1953–55, little difference in yield was found among the four red-fleshed bred varieties tested, but the best quality, in terms of dry matter and sugar content, was found in the land races Csány and Szentesi sárgahúsú [Szentes Yellow-fleshed], both of which gave lower yields and had a shorter growing season than the other material. In the female flowers of the Bulgarian variety Mramorni [Marble] and of Szentesi sárghúsú well-developed anthers containing fertile pollen were found.

2611 *Tomesányi, P. A gyümölcs-, szőlő- és dísznövényfajtak minősítési rendszere.* (*A system for the evaluation of fruit, vine and ornamental plant varieties*). (*pp. 421–40*).

The value of a variety is regarded as being made up of three main components, yield, market price and cost of production, which are further subdivided into 17 contributory factors. Formulae for evaluating a variety on the basis of the three components are presented. The application of this method of evaluation is discussed with special reference to fruit trees and other vegetatively propagated crops.

2612 Péquignot, Parneix, Boyeldieu & Récamier
Compte rendu des essais réalisés au Centre National d'expérimentation.
(Report on trials carried out at the National Experimental Station).
Cah. agric. écon. Grignon 1955 : No. 3 : 31–42.

In addition to the following, variety trials of spring oats, spring barley, peas for fodder and field broad beans were carried out at the National Experimental Station, Grignon, France, in 1953–54.

Wheat. Data on yield of grain and straw, resistance to lodging, frost and drought, period to earing and to maturity, 1000-grain weight and degree of susceptibility to loose smut and rusts are presented for some 20 varieties tested at Grignon.

Maize. The results of trials of American and French grain maize hybrids during the period 1950–54 are tabulated.

Potato. Information is presented on the total yields, average size of the tubers, susceptibility to diseases and period to maturity of eight varieties tested at Grignon in 1954.

2613 Stazione Agraria Sperimentale, Bari.
Relazione sull'attività della stazione nell'annata 1954–55. **(Bari Agricultural Experimental Station. Report on the activities of the station in 1954-55)** : 1956 : Pp. 96.

Breeding work referred to includes crossing to produce oats with earlier maturity, awnless barleys with shorter straw and improved selections of Trocadero lettuce and endive.

Selections have also been made in *Hedysarum coronarium, Vicia faba, V. sativa* and other *Vicia* species.

Wheat. The breeding of bread wheats is being directed towards the production of varieties of the "early-late" type suitable for the conditions of southern Italy (cf. Abst. 1596).

Maize. Tests with a number of maize hybrids have shown that for southern Italy breeding must be directed towards types with a very short phase of development from germination to flowering, in which pollination is effected at the end of May or in the first few days of June.

Forage plants. Studies have been made of imported and local strains of lucerne; some local wild forms are thought to be of interest for crossing on account of their vegetative vigour. A cold-resistant form of *Trifolium alexandrinum* has been selected. Observations are being made on wild forms of *T. squarrosum, T. incarnatum* and *T. repens* var. *giganteum.*

Sugar beet. Comparisons of varieties have shown Rov. AU and Klein AA to be the most free from bolting when sown in autumn.

Tomato. Selections of the local populations, with cylindrical fruits, have proved superior to San Marzano for peeling and a selection from a population in the Foggia plateau is suitable for conserving, combining earliness with high yield and resistance to mildew and blossom-end rot.

(Scientific session on questions of biology and agriculture. Riga, 22-26 October, 1951).
Akademija Nauk SSSR, Moskva 1953 : Pp. 575. [Russian].

The report contains the following items concerning plant breeding:—

2614 *Baranov, P. A.* (*Possibilities of extending grape cultivation into new, more northerly, regions*). (*pp. 243–51*).

The opinion is expressed that the original forms of *Vitis sativa* were not shade plants but bushes growing in places fully exposed to the sun and that this fact explains the wide range of adaptability of vines at the present time. The success of some of Mičurin's hybrids in extending viticulture northwards is mentioned; they do not generally contain more than 18–19% sugars in the berries and further improvements from renewed crossing with varieties of high quality are awaited. In the meantime it should be possible to grow certain varieties, such as Madeleine Angevine and some of the Mičurin hybrids, in the countries along the Baltic coast.

2615 *Siĭmon, A. M.* (*Achievements of popular selection in horticulture in the Estonian SSR*). (*pp. 259–67*).

The severe winter of 1939/40 killed off 84% of the fruit trees of varieties imported into Estonia from abroad whereas only 4% of those produced by local amateurs and private breeders were killed. This stimulated many growers to search for promising seedlings and a number of promising varieties that have been produced in this way are described. They include several hardy apples, pears, plums, gooseberries and black currants and certain vegetables including onion and carrot. Some of them were produced from chance seedlings and some by hybridization and application of Mičurinist techniques such as mentors and training the young seedlings.

Dolgušin, D. A. [Editor]
(Methods and results of plant-breeding and seed-production work.)
Vsesojuznyĭ ordena Trudovogo Krasnogo Znameni Selekcionno-Genetičeskiĭ Institut imeni T. D. Lysenko. (T. D. Lysenko All-Union Plant-Breeding and Genetics Institute).
Moskva, 1956 : Pp. 136. [Russian].

2616 *Kiričenko, F. G.* (*The winter wheat Odessa* 16). (*pp. 5–24*).

An extended account is given of the report summarized in *PBA*, XXVI, Abst. 1181.

2617 *Kalinenko, I. G.* (*Directed changing of an ordinary winter wheat into a branched form by environmental training*). (*pp. 25–42*).

An extended account of this report is referred to in *PBA*, XXVI, Abst. 320.

2618 *Musiĭko, A. S. & Ključko, P. F.* (*The new maize variety—Odessa* 10). (*pp. 43–52*).

Cf. *PBA*, XXVI, Abst. 1263.

2619 *Musiĭko, A. S. & Ključko, P. F.* (*Maize as a preceding crop for winter wheat*). (*pp. 53–59*).

The maize Kremnistaja Skorospelaja [Early Flint], a selection from North Dakota distinguished by higher yielding capacity and upright ears borne higher up the plant, ripens its grain in early August, 15–25 days before the varieties commonly planted in the Ukrainian steppes. This makes it possible to sow winter wheat in the stubble. Though its yields are less than those from medium and late varieties and hybrids, it has produced 25–27 c. of grain per ha. and up to 40–50 c. on small areas.

2620 *Musiĭko, A. S. & Ključko, P. F.* (*Introducing maize hybrids into commercial agriculture*). (*pp. 60–65*).

By pollinating the dent maize Dnepropetrovsk with the drought-resistant flint Gruševskaja Odesskaja [Odessa Gruševka] the hybrid Odessa 1 has been produced; it exceeds Dnepropetrovsk by 4–5 c. per ha. in grain yield, having given yields almost equal to that of the double-cross hybrid VIR 42 [Institute of Plant Industry 42] on some farms; efforts are now being made to produce VIR 42 at Odessa from its four original inbred lines and almost the whole maize area of the Odessa province will be planted with these two hybrids from 1956 onwards.

2621 *Musiĭko, A. S. & Krutenko, E. G.* (*Buckwheat in the sourthern Ukraine*). (*pp. 66–79*).

The variety Odessa was produced by pollinating the local varieties of the southern Ukraine with the variety Bogatyrj [Hero]; in the four years 1950–53 it gave an average yield of 11·8 c. per ha., which was 2 c. more than that of Bogatyrj. The yield was further increased by 13–16% by intervarietal open pollination; when the variety Bogatyrj was taken as pollen parent the increase was 16·1% whereas a pollen mixture from several varieties produced an increase of only 13·0%; pollination of Bogatyrj by Odessa gave a yield increase of 18·2%. The variety Slavjanka on the other hand tended to reduce the yield.

The best results from intervarietal pollination were obtained by sowing the seed and pollen parents in alternate rows. A yield increase of 13% was obtained from sowing a mechanical mixture of two varieties.

2622 *Musiïko, A. S. & Ključko, P. F.* (*Intervarietal crossing as a method of raising the yielding capacity of winter-rye seeds*). (*pp. 80–101*).

By sowing the seed parent together with several pollinating varieties seedlings were obtained which excelled the untreated controls in vigour, were equal or slightly superior in frost resistance and developed more rapidly in the spring; the mature plants had a larger number of fertile ears, which ripened 1–2 days before the controls, and the increase in grain yield varied from 1 to 5 c. per ha. The average yield of Veselyï-Podol rye over a seven-year period was 28·3 c. per ha. after cross pollination and 26·1 c. from the control.

The varieties Veselyï Podol and Taraščanskaja 2 retained the maternal type in the first and succeeding generations whereas Hitrinskiï's No. 6, a winter rye obtained by conversion of spring rye, contained only 46·3% of plants classed as typical of the variety after two generations of cross pollination. The grain quality was either better or worse according to which varieties served as pollinators.

The improvements referred to were maintained for six and more generations and by the use of this method a new variety, Odessa 1, has been produced by using Veselyï-Podol rye as seed parent and a number of varieties and local ryes as pollinators, selection being carried out for vigour, number of grains per ear, grain quality and resistance to pests, diseases, lodging and shedding. The selected plants were allowed to interpollinate and the resulting seed was bulked. The average grain yield of Odessa 1 over the six-year period 1949–54 amounted to 27·4 c. per ha., while that of Veselyï Podol was 25·3 c.; it has been considerably less attacked by brown rust and frit fly.

2623 *Šimanskiï, N. K.* (*Intervarietal hybridization of linseed involving the use of open pollination*). (*pp. 102–10*).

An abridged version of this article is referred to in Abst. 787.

2624 *Šimanskiï, N. K.* (*Intervarietal crossing of soya beans without emasculation*). (*pp. 111–16*).

A pollen mixture from several varieties was applied to young unopened flowers of the maternal variety, without emasculation. In this way from Harbin 111, pollinated with Dnepr 1, Kvitka, Amur 41 and selection 80, a strain resembling Amur 41 in seed colour and earliness was produced; it exceeded the maternal parent in both yield and oil content and was constant in morphological features.

A number of other hybrids produced on the same lines resembled the maternal parent in all respects but time of maturity, in which they were several days earlier; others were in every respect similar to the maternal parent and one resembled one of the pollen parents.

2625 *Kononkov, P. F. & Petrova, L. L.* (*Intervarietal crossing of tomatoes*). (*pp. 117–23*).

On pollinating with pollen mixtures from several varieties, better hybrids were obtained when some pollen from the maternal parent was also included in the mixture; in this way the yield of the variety Doneckiï was raised from 198·7 c. to 252·0 c. per ha.; the hybrids obtained without the addition of the maternal pollen yielded 211·6 c. per ha.

A promising new variety for irrigated land was produced by selection in a hybrid progeny from Odessa 71 x Majak [Lighthouse]; it has yielded 108·6 c. of ripe fruits per ha. compared with 84·72 from Majak and has been named Odesskiï Salatnyï 94/50 [Odessa Salad 94/50].

It is reported that tomato seeds have retained their germinating capacity for 12 and more years.

2626 *Vengrenovskiï, S. I. & Sokolenko, N. F.* (*New varieties of Sudan grass*). (*pp. 124–30*).

Further reference is made to the varieties mentioned in *PBA*, XX, Abst. 337. Odessa 25 was produced by intercrossing a number of forms selected from mixed plots comprising a large collection of different varieties, allowing the hybrids to interpollinate, selecting the best progenies and bulking their seed; this seed was reproduced by free interpollination. The plants of Odessa 25 grow to a height of 160–240 cm., the stems are thin and juicy and panicles emerge in the Ukrainian steppe in early July; the variety excels all others in drought resistance and gives 2–4 cuts per season; the yield is 15–25% better than that from other bred varieties, 60–90 c. of hay per ha. having been obtained in a season.

The variety Černomorka, obtained by the same

method, is resistant to drought and bacterial diseases; it is medium early and exceeds Odessa 25 by 14–20% in yield, having given 70–110 c. of hay per ha. per season.
The yields of green fodder from the two varieties were 263·9 c. and 292·4 c. per ha. in the two-year period 1952–53 and seed yields were from 10 to 14 c. per ha. Both varieties have proved successful in other areas besides the Odessa region.

2627 Šakirjjanov, S.
(Some results of the work of the Kamala State Plant Breeding Station).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 5 : 57–58. [Russian].
A number of improved varieties suitable for parts of Siberia and the Soviet Far East have been bred by the station and are enumerated. Special mention is made of the spring wheat Rybinskaja, which is drought resistant and with yields of up to 42 c. per ha. has surpassed the standard Albidum 3700 by 3·3–6·6 c. per ha. The spring wheat *Triticum durum* 'Hordeiforme 230' has yielded up to 40·4 c. per ha. and is distinguished by its strong straw.
A number of improved varieties of maize yielding 400–700 c. of green matter per ha. and the pea A–293 also receive praise.

2628 Oversikt over forsöksvirksomheten i jord- og plantekultur vekståret 1955. **(Survey of experimental work on soil and plant cultivation, crop year 1955).**
Kontoret for Landbruksforskning, Oslo 1955 : Pp. 103. (Mimeographed).

Oversikt over forsöksvirksomheten i jord- og plantekultur vekståret 1956. **(Survey of experimental work on soil and plant cultivation, crop year 1956).**
Kontoret for Landbruksforskning, Oslo 1956 : Pp. 116. (Mimeographed).
Details are given of the layout of trials in progress at various stations in Norway and of the varieties, strains and hybrid progenies participating in the tests. The crops undergoing trial include cereals, forage plants and peas. Red clover varieties are being tested for frost resistance and subjected to chromosome doubling by means of colchicine. In potato breeding, varieties used extensively as parents include the American strain USDA 41956, which is resistant to virus X, material carrying the genes R_1, R_2, R_3 or R_4 for blight resistance and *Solanum demissum* which is frost resistant.

2629 Åkerberg, E.
Från växtförädlingsarbetet vid Sveriges Utsädesförening. **(Plant breeding work at the Swedish Seed Association).**
Allmänna Svenska Utsädesaktiebolaget Svalöf 1957 : 4–5.
In this brief survey of current work, mention is made of recently developed varieties of oats, spring wheat, fodder pea and sugar mangel, descriptions of which have already appeared in *Plant Breeding Abstracts.* Among the chief breeding aims are quality, suitability for mechanical harvesting and resistance to pests and diseases.

2630 56. beretning om planteavlsarbejdet i landboforeningerne i Jylland. **(56th report on the crop cultivation work of the agricultural associations in Jutland).**
1956 (1957) : Pp. 711.
Data are given on the results of field experiments and varietal trials conducted by local agricultural associations throughout Jutland, Denmark. The crops tested include wheat, rye, barley, oats and potatoes.

2631 Thøgersen, O.
Beretning om landboforeningernes virksomhed for planteavlen på Sjælland 1956. **(Report on the crop cultivation work of the agricultural associations in Sjælland, 1956).**
København 1957 : Pp. 288.
This report includes numerous tables giving detailed results of trials, carried out by local farming associations throughout Sjælland, Denmark, of varieties of wheat, rye, barley, oats, potato, clovers, mangels and other crops.

2632 de Jong, J. J.
Constituent assembly and first congress of the European Association for Research on Plant Breeding held at Wageningen (The Netherlands) on 2, 3 and 4 July 1956.
Euphytica, Wageningen 1956 : **5** : 323–28.
The aims of the European Association for Research on Plant Breeding (Eucarpia), as discussed at its first congress, are briefly outlined.

2633 Stations Fédérales d'Essais Agricoles, Lausanne. Rapport d'activité 1955. **(Federal Agricultural Research Stations, Lausanne. Report of activity, 1955).**
Landw. Jb. Schweiz 1956 : **70** : 400–598; Publ. Sta. féd. Ess. agric., Lausanne Nos. 508–13.
In addition to the items listed below, mention

is made of variety trials of oats, root crops, fruit, lucerne, clover, asparagus and tomato.

Wheat. Swedish, German and French varieties notable for their good yields, resistance to lodging and winter hardiness have been crossed with the Italian varieties Salto [Leap], Mara, Fortunato and 0·10, all of which mature early but are susceptible to frost and lodging and do not tiller well. European varieties have also been crossed with South American varieties characterized by early maturity, resistance to diseases and good baking quality. The F_2–F_4 back-cross progenies of crosses between wheat and rye and the F_1–F_2 of crosses between wheat and *Agropyron* are being studied. The F_1 of crosses between *Aegilops* and *Triticum* proved male sterile and were back crossed to the *Triticum* parent. Varieties of *T. vulgare* have been crossed with *T. timopheevi*, *T. dicoccum*, *T. durum*, *T. turgidum* and *T. persicum*. The results of variety trials of spring and winter wheats are also reported. MC245, followed by Probus, possessed the best resistance to frost.

Oats. The Danish varieties Pajbjerg Regent and Abed Palu proved the most resistant to lodging.

Rye. Carsten gave the highest yields of the winter rye varieties tested but lacked winter hardiness. The fertility of a number of auto-tetraploid lines has been improved by intensive selection.

Maize. Several new hybrids developed at Lausanne mature earlier and give higher yields than the American introduction W270. Experimental three-way crosses are being carried out.

Barley. Tetraploid forms of Herta, BJM33 and BJM34 have been obtained by colchicine treatment.

Tobacco. The introduction of Jaune R [Yellow R] and Burley R, two new varieties that are resistant to *Thielaviopsis* sp., has resulted in the almost total disappearance of foot rot at the Lausanne station.

2634 Chang, H. T., Cheng, C. F., Luh [Lu], C. L. & Chang, H. S.
Crop variety improvement and seed multiplication work in Taiwan.
Pl. Indust. Ser. Chin.-Amer. Joint Comm. rur. Reconstr., Taiwan 1956 : No. 7 : Pp. 35.

A synopsis is given of the principal varieties grown in Taiwan, current breeding projects and research stations concerned with the following crops: wheat, rice, sweet potato, jute, sugar cane, tobacco, tea, citrus fruits, groundnut, pineapple and soya bean.

2635 **Progress Report of the Institute of Plant Industry, Indore, Madhya Bharat, for the year ending 31st May, 1956** : Pp. 81.

The results are reported of varietal trials carried out with maize, sorghum, rice, linseed, peas, grain and groundnut.

Cotton. Selection and strain testing have continued under the schemes for developing improved local and American cotton varieties for the Malwa region. Trials of selections from the following interspecific hybrids have been carried out: (1) colchicine-doubled (*Gossypium arboreum* x *G. thurberi*) crossed with *G. hirsutum*; (2) colchicine-doubled (CO2 x 1027ALF); and (3) (CO2 x *G. tomentosum*) x *G. hirsutum* 'Indore 2'. Several selections are promising and are to undergo further trials on a larger scale. Selections with *G. tomentosum* in their parentage do not show the expected jassid resistance but recover rapidly both from jassid attack and waterlogging and are resistant to drought. However some selections among *G. thurberi* hybrids have exhibited a high degree of resistance even to heavy jassid attack. Promising results have been obtained with F_1 selections from the cross *G. barbadense* 'Quebradinho' x CT14–22 (a hybrid involving *G. tomentosum*) made with a view to developing a high-yielding, long staple, perennial F_1 hybrid.

Genetical studies have continued with special reference to the inheritance of fuzz and lint colours in Upland cotton, the inheritance of seed fuzz intensity and spot size in Asiatic cottons and the transference of *G. anomalum* lint genes to Asiatic cottons. In connexion with the last of these objectives crosses have been made between *G. anomalum* and several hairy and lintless mutants of *G. arboreum* and *G. herbaceum* including strains of *G. herbaceum* carrying l_{1a}, l_{1b}, l_{1d} or $l_{1a}l_{1d}$. It is hoped to transfer the L–l_{1d} chromosome segment from *G. anomalum* to *G. herbaceum*. F_1 plants of *G. anomalum* x *G. herbaceum* li_d were found to be linted, with a lint length of about 17 mm. but with straight hairs. Five plants of the back cross to *G. herbaceum* have been obtained.

Varieties and strains have been tested for their reaction to *Fusarium vasinfectum*.

The statistical study of genetical variability and response to selection, using hybrid material of *G. arboreum*, has now reached the F_{15}. Although the maximum halo length of selected progenies dropped in the F_{10} and F_{11} and again in the F_{13} to F_{15} generations, the excess of the maximum halo length of the progenies over that of the parents shows an increase with each generation

in some crosses. Genetical variability was found to be high in crosses between long-haloed and short-haloed lines and within short-haloed lines in the F_2. A suggested explanation for the unexpectedly high value of variability in crosses within short-haloed lines is that the genes for short halo differ according to the line while such differences do not exist for long halo.

Linseed. Isolates of *Fusarium oxysporum* f. *lini* from various localities in Madhya Bharat were found to vary appreciably in their pathogenicity indicating that physiological races of the fungus may exist. The response of 94 varieties and hybrids from various sources in India to *F. oxysporum* f. *lini* has been investigated.

2636 **Administration Report of the Director of Agriculture of Ceylon for 1955. Part IV. Education, Science and Art (C).** 1956 : Pp. 136.

Maize. Inbreeding of local varieties and introductions continued as the initial step in hybrid production.

Rice. Of the four hybrid strains issued, three had Burmese strong-strawed varieties as parents and are moderately resistant to lodging. H106, the most promising strain, yielded 87 bushels per acre and had a milling outturn of 68%. In addition to such features as fertilizer response, milling quality and resistance to grain shedding and drought, the development of strains with three-months' duration for the dry zone and of strains tolerant of water-logged conditions for the wet zone is receiving particular attention. In breeding such varieties for the dry region, early Chinese varieties were used as parents. Selection within indigenous varieties continued at Batalagoda and other centres. The variety Murungakayan has been the source of the most valuable pure lines, which give an average yield of 60 bushels per acre, resist drought and show high response to fertilizer. These lines are to replace Vellai Ilankalyana 28061. The finding that these and other indigenous strains of *indica* are highly responsive to fertilizer is of interest in view of results to the contrary in most other countries. Murungakayan was highly resistant to *Cochliobolus miyabeanus* in a test at Karadian Aru.

Sugar cane. Hybridization and testing of the resulting seedlings are under way. Tests of pollen viability showed Co. 453, Co. 617, Co. 213 and Co. 214 to be suitable as ♂ parents. Co. 655 and Uba yielded little or no viable pollen but are suitable as ♀ parents. POJ2878 and Co. 421 showed fluctuation in amount of viable pollen produced during the season.

Chilli. Selection for resistance to leaf-curl virus received attention at Tinneveli.

2637 **Administration Report of the Agricultural Department, Travancore, for the year 1952-53** (1954) : Pp. 65.

Administration Report of the Agricultural Department, Travancore, for the year 1953-54 (1955) : Pp. 54.

Rice. Selection of indigenous types continued at several stations. A programme of developing varieties resistant to salinity and flooding was initiated at the Paddy Breeding Station, Monkompu.

Nuts. The new Cashewnut Research Station was established at Kottarakara in 1952. Selection is in progress.

2638 **Annual Report of the East African Agricultural and Fisheries Research Council, 1955-1956** (1957) : Pp. 56.

Maize. At the Eldoret substation, breeding for streak resistance and application of the Brieger method are receiving attention. According to this method, inbreeding is carried out for three generations, in each of which lines showing the least reduction in yield combined with maintenance of other desirable characters are selected. Lines are further selected on the basis of the performance of the progeny of crosses within the group; the best parents are then bulked for seed production.

Transference of resistance to *Puccinia polysora* from Central-American types to local varieties in the different regions continued; further work on the genetics of resistance and of resistance to the new race which has appeared in glasshouses was also carried out (cf. *PBA*, XXVI, Abst. 405).

Cassava. Breeding continued at Amani with the purpose of developing (1) clones resistant to mosaic and brown streak and (2) clones possessing resistance to these viruses and bitter roots so that they are unpalatable to wild pigs.

Groundnut. Attempts at interspecific hybridization by normal methods and embryo culture were unsuccessful.

2639 Rapport annuel pour l'exercice 1955. (**Annual report for the financial year 1955**).
Publ. Inst. nat. agron. Congo belge 1956 : Pp. 568.

In addition to the crops mentioned below, the results of variety trials and breeding of

Pyrethrum, *Urena lobata*, millet, sorghum, cassava, sweet potato, citrus fruits, cotton and coconut are mentioned.

Maize. Breeding for resistance to *Puccinia polysora*, *Sclerospora* spp. and *Helminthosporium* spp. is being continued.

Rice. Varietal differences in reaction to lodging and shedding are noted. Crosses carried out between Vary Lava and a number of pedigree lines of other varieties have given promising results as regards yield and grain quality.

Coffee. Clone L93 of *Coffea robusta* has been treated with colchicine to obtain plants that can be crossed with *C. arabica*. Crosses in all possible directions have been carried out between the clones SA158, L36, L48, L93, L147, L215 and L251. In variety trials, the best results in respect of yield and quality of the beans were obtained from SA158/139, L36/115, L93/262 and L251/128. A number of new rootstocks have been developed.

Cacao. The results of trials of legitimate seedlings of Eala mother trees and of illegitimate seedlings of Forastero mother trees are reported. In clonal trials, F996Y2, E247Y1, M41Y455 and F10Y2 gave the highest yields.

Oil palm. Investigations on the inheritance of the *albescens* character continued (cf. *PBA*, XXVI, Abst. 1022). In *tenera* x *tenera* and *tenera* x *dura* crosses, the latter had a higher ratio of flesh per given weight of fruit. A number of *dura* x *pisifera* and *tenera* x *dura* hybrids are undergoing study.

Rubber. In clonal trials at Yangambi, Tj.1, M4, M8 and the cross Tj.1 x Tj.16 gave the highest yields of latex per tree. Y3/46 proved highly resistant to brown bast and M8 to *Oidium heveae*. Polyploid forms of *Hevea* have been obtained by colchicine treatment. Legitimate and illegitimate seedlings of Tj.1 and Tj.16 gave good results in tests of three-year old seedlings. Clonal differences in susceptibility to *Helminthosporium heveae* and *Oidium heveae* are noted.

Groundnut. Several polyploid strains have been obtained by colchicine treatment. Crosses were carried out between the high-yielding varieties A20, E4/2, C27/3/4/1/3/AB/3 and A92.

Banana. Crosses have been successfully effected between the dessert variety Km5 and *Musa acuminata*; a cross between the plantain variety Bosua and *M. brachycarpa* failed.

Soya bean. Line selection is being carried out to improve the homogeneity of varieties grown in the Belgian Congo. Emphasis is also being placed on breeding for early maturity.

2640 Description du matériel d'élite sélectionné récemment par la Division des Plantes vivrières de Yangambi. (**Description of élite material recently selected by the Food Plant Division at Yangambi**). Bull. INEAC 1957 : **6** : 47–59.

Tabulated data, illustrated by means of photographs, are presented on the parentage and botanical and agronomic characteristics of some of the more valuable varieties and strains of rice, groundnut, soya bean and cassava developed at Yangambi, Belgian Congo, in recent years.

2641 **Progress Report of the Dominion Experimental Farm, Morden, Manitoba, 1947-54** (1956) : Pp. 64.

Maize. The chief objective of breeding is the production of early-maturing hybrids which mature satisfactorily in unfavourable seasons. Suitability for mechanical harvesting and resistance to smut are also being sought. Morden 74 [(WD x ND255) x (15 x 38)], a flint dent, was licensed. The dent hybrid Morden 77 [(WD x ND255) x (A116 x V3)] was also released (cf. *PBA*, XXI, Abst. 1686). Both have the desirable property of low content of ear moisture at harvest, in addition to giving high yields. Improvement of the component inbreds of the two hybrids is in progress.

Sweet pepper. The new early variety Morgold, which involves Harris Earliest, Merrimac Wonder and King of the North in its parentage, is compact and umbrella-shaped, with a height of 12–14 in. Its large fleshy fruits turn golden yellow when ripe.

Sunflower. The rust-resistant variety Beacon was released as a stop-gap until a rust-resistant hybrid has been bred (cf. Abst. 2131). Compared with the standard hybrid Advance, Beacon is less uniform, taller and later in maturity. It is slightly inferior to Advance in oil content when rust is absent but superior if rust is severe. Beacon derived its rust resistance from a single plant selected from Texas Wild Annual. Three other sources of resistance have been discovered, in one of which resistance has been found to be simply inherited; transfer of resistance to the parents of Advance by back crossing is therefore expected to be rapid. New lines developed from the material used in producing Beacon considerably outyielded Advance in combining-ability tests in two seasons when rust attack was not severe.

Apple. Anisim, Antonovka, Patten Greening and Tetovsky are among the varieties which have been outstanding as female parents in the

production of promising open-pollinated seedlings. Descriptive notes are given on eighteen seedlings of open-pollinated or known hybrid origin, released for trial by growers. One has been named Kerr (Dolgo x Haralson). It is an apple-crab bearing highly coloured fruits $1\frac{3}{4}$ in. in diameter, acceptable for dessert, jelly making and canning.

Cherry. Open-pollinated seedlings of *Prunus fruticosa* and *P. tomentosa* have been distributed for trial. Hardy varieties with high-quality fruits are expected from crosses between *P. fruticosa* and varieties of *P. cerasus* such as Montmorency, Early Richmond and Wragg.

Raspberry. Nine seedlings derived from crosses between Chief and Indian Summer have been distributed for trial.

Gooseberry. The following selections are to undergo commercial trial: M–521 (Sunset x Carrie), M–522 and M–525 (Abundance seedlings), M–523 (Perry x Sunset), M–524 (Sunset x Perry) and M–526 (Pixwell x Charles).

Rhubarb. Improved strains are being developed from crosses involving the red-leaf resistant varieties Macdonald and Canada Red. Inbreeding of these varieties has resulted in vigorous seedlings with bright red stalks.

Cucurbits. The discovery of an early, large-fruited, monecious musk melon has facilitated the development of a valuable F_1 hybrid.
The F_1-hybrid cucumbers Morden Early and Morcrop have been produced (cf. *PBA*, XXVI, Abst. 1025).

Tomato. The F_1-hybrid Monarch and Mustang (cf. *PBA*, XXII, Abst. 997) and open-pollinated variety Meteor [(Earlinorth x Bonton) x Bonton] were introduced; all three have a bush habit. Meteor is as early as Early Chatham.

Pea. An aim of breeding is the production of sturdy, wind-resistant varieties. Tiny Tim, a variety with an average height of 8–10 in., is recommended for exposed positions (cf. *PBA*, XXI, Abst. 1686).

Sweet corn. A new high-yielding hybrid shows promise of meeting the requirements of the canning industry.

2642 **The National Research Council Review, Ottawa 1956** : Pp. 284.

Associate Committee on Plant Breeding (pp. 218–23).

Work in progress during 1955 included the following items:—

University of Alberta.

Genetic evaluation of wild and primitive wheats and barleys, and the cytogenetical analysis of *Triticum* using nullisomes and monosomes, have been continued and induced tetraploidy in barley has been studied.

University of Manitoba.

Substitution of rye chromosomes in winter wheat, natural and experimental polyploidy in some grasses and herbs and its agronomical significance and the development of ring formation in barley have been under investigation and cytotaxonomical investigations of the Canadian flora have begun.

University of Saskatchewan.

The inheritance of stem-rust reaction to race 15B in the diallel crosses of four durum varieties and radiation-induced mutations in plants have been studied.

2643 **Report of the Minister of Agriculture for Canada for the year ended March 31, 1956** : Pp. 157.

Wheat. Breeding work on *Triticum durum* is to be intensified. Released in 1954, the stem-rust resistant spring wheat Selkirk occupied 64% of the wheat acreage of Manitoba in 1955 (cf. *PBA*, XXIV, Abst. 1786).

Oats. The early-maturing selection 3928, highly resistant to leaf and stem rust, was increased in preparation for its expected release; its pedigree consists of Roxton and Ajax and rust-resistant hybrid lines. New crossing procedures (unspecified) have been developed to impart the resistance to such diseases as the rusts and *Septoria* found in wild species of *Avena* to cultivated oats.

Maize. In view of the increasing importance of stalk-rot infection in south-western Ontario, resistance to this disease is receiving priority in hybrid breeding. The inbreds CH9 and B14, developed at Harrow, Ont., and the Iowa Agricultural Experiment Station respectively, are being used as sources of resistance.
The early-maturing yellow dent hybrid Canbred 235 was released under the name Pride K5.

Barley. The new rust-resistant malting barley Parkland equals Montcalm in quality but surpasses it in straw strength and yield (cf. *PBA*, XXVI, Abst. 2326). The early-maturing fodder barley K4061–8 (Montcalm x Olli) is being increased in view of its possible distribution in northern Ontario. Resistance to jointworm (*Harmolita hordei*) has been incorporated in agronomically satisfactory hybrid lines at the Charlottetown Experimental Farm, PEI; the variety Mianwali has proved to be one of the

best sources of resistance. Winter-hardy material for breeding has been obtained from *Hordeum leporinum* x *H. vulgare*.

Forage grasses. Chromosome number and morphology have been studied in many representatives of *Agropyron, Elymus* and other genera. *Agropyron cristatum* 'Summit' was licensed (cf. *PBA*, XXIV, Abst. 3059).

Lucerne. Varieties resistant to bacterial wilt had lower amounts of aminoacids than susceptible ones; resistance may therefore be associated with insufficient supply of nutrients for development of the pathogen.

Potato. Breeding for late-blight resistance at the Fredericton Experimental Farm, NB, has been complicated by the discovery of a new strain of the pathogen, tentatively identified as race 1.2.3.4.5. Seedlings resistant to this race have been obtained. Field immunity to some viruses has been secured in the progeny of certain crosses which have at least one parent selected from European breeding material. Seedlings 1711–9 and F4775 displayed a high degree of resistance to scab.

Tobacco. The burley variety Improved Briar, developed for the export trade, was released (cf. *PBA*, XXVI, Abst. 1025). The imported flue-cured variety White Gold (Oxford 492 x Golden Yellow) is to be registered for commercial production; its desirable characters include a high degree of resistance to black and brown root rots.

Apple. Goodland, an open-pollinated seedling of Patten Greening, has been developed at the Morden Experimental Farm, Man. A moderately-productive annual bearer, it ripens in mid-September and keeps well until the end of December. In general, the characteristics of the crab apple have been dominant in crosses with large-fruited varieties.

Raspberry. A selection of Ottawa x Rideau, superior to Latham in fruit size, firmness and quality, has been named Carnival; it ripens at the same time as Latham. Another selection, developed from Ottawa x Madawaska, has been named Comet. Ripening slightly earlier than Carnival, it has given a good performance with respect to yield, quality and hardiness at Charlottetown, PEI.

Strawberry. The seedling Agassiz 53 shows promise as a variety suitable for the heavier types of soil in British Columbia.

Tomato. Superior to standard varieties in yielding ability and resistance to cracking, the selection Ottawa TO–17 (Bounty x Early Rutgers) has been named Ferguson.

2644 **79th Annual Report of the Ontario Agricultural College and Experimental Farm for 1954** (1955) : Pp. 75.

80th Annual Report of the Ontario Agricultural College and Experimental Farm for 1955 (1956) : Pp. 84.

Most of the work mentioned in the second of these reports has already been summarized from another source (cf. Abst. 1291).

Barley. A high percentage of tetraploid plants has been produced by colchicine treatment.

Lucerne. A cytological study of *Pseudopeziza medicaginis* indicated that nuclear behaviour is normal but that the mechanism for outbreeding has probably been lost, so that opportunities for variation in pathogenicity are limited. The problem of breeding resistant varieties may therefore be simpler than was anticipated.

Potato. Seedlings 1711–9 and 2213–175 continued to show good resistance to *Streptomyces scabies*, high yield and good cooking qualities. About 5500 seedlings were screened for scab resistance and a technique for distinguishing between pathogenic and nonpathogenic strains of the fungus, based on their serological behaviour, is being worked out.

Varietal differences have been found in respect of surface bruising during mechanical harvesting, least bruising being shown by Ontario.

Cucumber. The hybrid P200 x SM12–12 has been found to be resistant to both mosaic and spot rot and the hybrid H103 to be earlier, superior in colour and more resistant to root rot than other varieties in greenhouse tests at four localities. A Korean cucumber, *Cucumis sativus* PI220860, which possesses one or more sex modifiers conditioning the development of female flowers only, has been used in the production of hybrid seed.

Tomato. Black Queen x Clark's Hybrid F_2 sd has proved outstanding for canning purposes.

Lima bean. Plants grown from seeds which survived storage in cold chambers have shown increased resistance to cold in the field.

2645 **Annual Report of the University of Florida Agricultural Experiment Stations for the fiscal year ending June 30, 1955** : Pp. 356.

In addition to the breeding work reported below brief reports are given of varietal trials of wheat, oats, rye, maize, sorghum, forage grasses, clover, potato, sweet potato, cotton, ramie, groundnut, onion, cabbage, broccoli, cauliflower, cantaloupe, squash, cucumber, tomato, bean, soya bean, pea and sweet corn.

Oats. Among the segregating progeny of irradiated Southland, six plants have been found possessing resistance to *Puccinia coronata* var. *avenae* and among the progeny of irradiated Floriland plants without awns and basal hairs have been selected. Irradiated progeny of Floriland are being used to initiate a recurrent selection programme designed to determine the effect of accumulation of induced micro-mutations.

At the Gainsville disease garden, 37,000 varieties and selections were tested for their reaction to *P. coronata* var. *avenae*. A crown rust nursery has been established at 20 localities in Florida in an attempt to measure differences in the presence and prevalence of different races of the fungus throughout the state.

At the North Florida Station some lines combine the known major sources of crown-rust resistance with the Hajira-Joanette type of resistance to *P. graminis* var. *avenae* and superior lines from this material have been crossed with new sources of crown rust resistance and with lines resistant to stem rust race 7A.

A selection from the cross [(Hajira-Joanette x Bond-Rainbow) x Santa Fe, Minn. Sel.0–200–10] x Southland appears to combine the Santa Fe type of resistance to crown rust with resistance to the prevalent races of stem rust at low and high temperatures. Its straw strength is less than that of Southland but it gives good yields and is being reselected and increased.

About 40,000 X_2 Floriland plants have been subjected to severe artificial infections of crown rust and stem rust race 7A and from this population plants were selected which showed stem rust resistance, improved kernel type and shorter straw. Only eleven plants showed resistance to race 7A.

Purification of foundation stocks of Floriland and Sunland has been attempted with a view to eliminating off-type kernels thought to represent segregates or mutants resulting from crosses involving *Avena byzantina*.

Rye. Studies have been begun using Florida Black, Abruzzi and selection 8–21 treated with two dosages of X rays and two lengths of exposure to thermal neutrons.

Maize. The third cycle of selection for combining ability with F44 x F6 has been completed. The test hybrids produced an average of 7% more grain than Dixie 18 and 12% more than those of the previous cycle. At the Everglades Station 465 varieties have been screened for resistance to *Helminthosporium turcicum* for use in a breeding programme. No variety was found resistant to attack by 600 to 800 red-wing blackbirds per acre. The North Florida Station recommends Dixie 18 and Coker's 811 for northern Florida, on the basis of yield and lodging and weevil resistance. Three experimental hybrids have given higher yields than Dixie 18 though not exceeding it in lodging and weevil resistance.

Rice. The varieties grown in the USDA uniform nursery at the Everglades Station have been grouped into four classes, (1) early maturing, with short and medium grain, (2) early maturing, with long and slender grain, (3) midseason, with long and slender grain and (4) midseason, with short and medium grain. The following forms are resistant to *Piricularia oryzae*: (1) Lacrosse x Magnolia and 250–3 x Magnolia, (2) Hill Selection x Bluebonnet and (4) Asahi [Rising Sun] and Calrose. Of 75 United States varieties tested, including 51 unreleased, 30 were resistant to *P. oryzae*.

Forage grasses. Considerable variability has been observed between selections of both Bermuda grass and St. Augustine grass, *Stenotaphrum secundatum*, in respect of response to fertilizer and cutting rates, growth and seed production. No superiority to parent lines has been observed in the progeny of Bahia-grass crosses made either naturally to self-sterile lines or by hand pollination between broad-leaf and narrow-leaf strains.

Red clover. Mass selection for resistance to *Erysiphe polygoni* has proved effective, the number of resistant plants in the nursery being increased from 70% in 1954 to 78% in 1955.

Lupin. Several mutants selected from X-irradiated Alta Blue have been increased for seed. White-seeded yellow sweet lupin seed has been irradiated with thermal neutrons and X rays, giving several mutants, including virus-free plants, in the first year progeny.

Kenaf. Many breeding lines which are highly resistant to race 1 of *Colletotrichum hibisci* were found to be completely susceptible to race 2, while other lines gave an intermediate reaction.

Sansevieria. Some *S. trifasciata* seedling clones have been found to be superior to their parents in resistance to cold and disease. The hybrids *S. trifasciata* x *S. deserti* appear promising for fibre production, comparing favourably with *S. trifasciata* in respect of cold tolerance, fibre percentage and fibre quality and showing good disease resistance. Both this hybrid and *S. trifasciata* x *S. parva* were found to be fertile, and in the first case seedlings of the back cross to *S. trifasciata* have been obtained. The hybrid *S. trifasciata* x *S. liberica* was found to be sterile.

Sugar cane. The most promising selections of the F46, F49, F51 and CP series are listed. Selections have been made in the F52 series and have been planted at three localities for further observation. Since many of the seedlings from crosses made in 1953–54 were killed by frost it is hoped that some of the surviving plants may possess some resistance to cold. Further crosses were made in 1954–55.

Tobacco. Selections have been made on the basis of root-knot nematode resistance and number and size of leaves in flue-cured tobacco, in an attempt to overcome the association between high resistance and narrow leaf. Promising results in this respect have been obtained with two interspecific hybrids, Bel–4–30 and Bel–4–31. At the North Florida Station selection 913 (Rg x bacterial-wilt resistant 8259) has shown resistance to *Phytophthora parasitica* var. *nicotianae* and wilt and has given good yields of high-grade leaves. Testing of lines selected from plants resistant to *Perenospora tabacina* continued.

Capsicum. Selections showing apparent tolerance or resistance to tobacco etch virus, and in some cases also to cucumber or tobacco mosaics, have been crossed with a view to introducing virus resistance into a sweet-bell type of pepper suitable for growing in Florida.

Tung. A number of F_2 plants from *Aleurites montana* x *A. fordii* have now flowered, nine fruits being set by open pollination and three by hand pollination from F_1 plants of the same cross. Selections have been made from late-flowering and high-yielding trees and from controlled *A. fordii* crosses.

Peach. Promising results have been shown by breeding material, including some of the F_2 progeny of Southland x Hawaiian, and selections with fruit quality superior to that of Jewel have been planted in several localities in Florida for further trials. Root stocks showing resistance to root-knot nematodes have been selected for further testing.

Mango. Of 383 seedlings planted in 1949–51, 52 have so far fruited but only one of these, a Harris seedling, has been selected for further observation. Seven varieties have been named and described (cf. *PBA*, XXV, Abst. 3377).

Macadamia. Observations and yield records of selections are being continued. Two of the selected clones are promising and Kohala has shown the best growth of the Hawaiian varieties under trial.

Groundnut. Crosses have been made between Virginia Jumbo Runner, Dixie Runner and Florispan Runner and large-seeded runner strains of Spanish-Virginia Jumbo Runner origin, with a view to developing lines with medium to large seeds of good quality.

Rubus. A large number of F_1 plants from crosses between *R. albescens* and Latham, Sunrise and Taylor red raspberries have fruited and several have been selected for further testing. Back crosses of F_1 and F_2 plants from *R. albescens* x Latham and Sunrise and hybrids of *R. albescens* with Manteo, Evans and Cumberland black raspberries are undergoing field trials.

Strawberry. Selections have been made from the F_1 progeny of the first two of the following crosses, Missionary x Florida Ninety, Albritton x Florida Ninety and Missionary x Albritton, made during 1953–54 and from two open pollinations, Florida Ninety and Florida 45. Four crosses were made in 1954–55, namely Florida 45 x Florida Ninety, Florida 45 x Albritton, Florida Ninety x Albritton and Md. US2101 x Florida Ninety.

Grape. Selection 1004, from the cross CS47–40 (*Vitis smalliana*) x Golden Muscat (*V. labrusca* x *V. vinifera*), has surpassed all other dark grape selections. It is five days earlier than Lake Emerald, produces larger bunches of fruits and has so far remained free from grape decline. Other promising selections are 1001, 1147 and 1170. Further crosses have been made.

Celery. Field observations of horticultural characteristics and resistance to *Cercospora apii* have been made on progeny of all generations from F_2 to F_{11} inclusive from a cross between a Turkish and a Danish variety and also on 24 commercial varieties and strains, and selections have been made which will be increased in Florida, California and New York.

Cantaloupe. Further crosses and selections have been made during 1955.

Water melon. Inbred selections F53–3 and F53–5 are inferior in quality to Charleston Gray although they yield well, while F_1 hybrids C53–3 and C53–7R compared favourably with Charleston Gray in respect of yield, quality and disease resistance and were superior to Congo. Some F_2 progenies from crosses made in 1953 have proved highly resistant to *Fusarium* wilt and further crosses have been made among the F_1 progeny of the same lines.

Tomato. At the Indian River Field Laboratory, CAStW131–2–2–Bk–12–1–Bk has been outstanding in trials, maturing earlier and showing less cracking than Manalucie. Other promising lines include CAStW87–6–Bk–Bk, CAStW131–2–2–Bk–7–Bk–Bk and Mims 52S–3–Bk, a selection from CAStW131, for autumn growing, and CAStW131–2–2–Bk–FPI–Bk,

CAStW131–2–2–Bk–12–FPI–Bk and 80–3–Bk–1–Bk CAStW for spring growing.

At the Gulf Coast Station, Manalucie, CAStW131–2–2–Bk–12–1–Bk and 55–3–2–Bk–CAStMW were superior in the autumn trials and in trials carried out as part of the Southern Tomato Exchange Programme, STEP 232, Manalucie, STEP 190 and Moreton Hybrid were outstanding, although Moreton Hybrid is not resistant to *Fusarium* wilt. Selections from STEP 250 (CAStW131–2–2–Bk–12–2–Bk–Bk) and STEP 252 (80–3–Bk–1–Bk CAStW), having the combined disease resistance shown by Manalucie but with better cracking resistance, are ready for commercial testing as are selections from a superior late-determinate type, 115–1–CAStW. Some selections with combined resistance to tobacco mosaic and etch have now reached the fifth generation but have not yet undergone horticultural evaluation since they are all susceptible to potato virus Y.

Homestead 2, a uniform plant selection from Homestead (cf. *PBA*, XXIII, Abst. 1554), has been released by the Subtropical Station. This station also reports that no stock so far tested possesses resistance to all races of *Phytophthora infestans*.

Bean. Two wax bean lines, 101B and 101W, are to be increased for further testing. 101W is the better of the two but is subject to about 30% seed coat splitting. Of the green podded dwarf types Fla.3 is of high quality and is being back crossed to Blue Lake pole bean in the hope of producing a bean having the Blue Lake type of pod but a dwarf habit. F_2 seed has been obtained from twelve new crosses and reciprocals made with a view to developing high quality beans suitable for mechanical picking.

The rust-resistant pole bean selection Fla.201–2 has been released under the name of Florigreen (cf. *PBA*, XXV, Abst. 3525). Some F_6 and F_7 selections from a chance cross between this variety and Blue Lake are superior to Florigreen in that they are stringless and give higher yields. A hybrid is reported between *Ph. vulgaris* and *Ph. xanthotrichus*.

Lima bean. Progress in transferring the hypogeal germination habit of *Phaseolus polystachyus* to large-seeded strains of *Ph. lunatus* is proving slow, although fertility has been increased by back crossing to the two parent species.

Cowpea. Eight breeding lines appear to be better than comparable commercial varieties and to have achieved reasonable genetic homozygosity. A promising Brown Crowder type plant is being increased and crossed to cream-seeded and black-eye lines.

Pea. Line P–84 has been released to seed growers under the name of Emerald and Fla.2, 4 and 5 have all been crossed to it.

Sweet corn. Screening for resistance to *Helminthosporium turcicum* has been carried out with 470 hybrids, 306 inbreds and five open pollinated lines. Several of the more resistant hybrids were considered to be promising in other respects also. A programme of development of inbreds with resistance to *H. turcicum* by combining the resistance of LTB, Me2rt, 48162 and 270 with the desirable plant and ear characteristics of other inbred lines was initiated.

2646 Giles, W. L.
Research for Delta area of Mississippi.
Miss. Fm. Res. 1956 : **19** : No. 9 : 3–5.

The following reports of interest to Plant Breeders are included in the Annual Report of the Delta Branch Experiment Station, Stoneville, Miss.

Oats. Two new selections, CI6998 and CI7152, both possessing the Landhafer type of resistance to *Puccinia coronata*, have proved outstanding in respect of straw stiffness and lodging resistance. Other selections are promising in respect of disease resistance but do not possess the same degree of lodging resistance. A large number of the X_2 generation of irradiated Delair seed were grown and a few were found to have considerably shortened straw but none were found to have acquired resistance to *P. coronata*.

Maize. The new white hybrid Dixie 55, formerly Miss. 1123, has given good yields in four tests and several of the newer inbreds showed considerable promise.

Forage grasses. A strain of rescue grass, *Bromus unioloides*, selected from an introduction from Uruguay has proved immune to head smut collections from Georgia, Alabama, Mississippi and Texas and only slightly susceptible when inoculated with a strain from Louisiana, while Commercial, Chapel Hill and Texas 46 were susceptible to all inoculations.

Selections of annual ryegrass which remain free of rust and leaf spot in the field were self pollinated to provide seed for further testing.

Cotton. The transfer of several characters, including D_2 smoothness, bract flare, absence of nectaries, deciduous bract, resistance to the nematode-*Fusarium* wilt complex, high lint percentage, increased lint length and improved fibre strength, to doubled haploid cottons has been continued. The cross D_2 smooth x doubled haploid has now reached the ninth and tenth back-cross generations and intensive selection

is in progress. Development of superior smooth-leaved strains is progressing, weakness of fibre being eliminated by intensive selection. Details are given of the results of varietal trials.

2647 **Research on fruit, vegetables and flowers.**

Miss. Fm. Res. 1956 : **19** : No. 8 : p. 4, 6.

Varietal trials have been carried out by the horticultural department at State College, Miss., during 1955–56 with potato, sweet potato, collard, lima bean, snap bean and cowpea and breeding has continued with sweet potato, apple, raspberry, strawberry, collard and snapbean.

Cucumber. Breeding for resistance to *Pseudoperonospora cubensis* has continued using good pickling varieties and resistant lines.

Tomato. Promising results have been obtained in breeding for resistance to *Fusarium* wilt. Selections from multiple crosses with a tomato from Costa Rica have grown vigorously and set fruit well at high temperatures. It is also reported that a source of nematode resistance has been found and is to be incorporated into the breeding programme.

Sweet corn. Ears have been selected from 147 breeding lines for selfing and top crossing to Golden Security.

2648 **Research and the soybean story 1955-1956.**

Bull. Mo. agric. Exp. Sta. 1956 : No. 676 : Pp. 124.

Wheat. Selections giving the highest yields included three from Vigo-Clarkan x Norin 66 [Ministry of Agriculture and Forestry 66], which had inherited the short growth and earliness of the Japanese parent Norin 66.

Oats. Mo.O–205 continued to be superior to other named varieties in yield and test weight (cf. *PBA*, XXIV, Abst. 273). In order to improve its lodging resistance, Mo.O–205 has been crossed with Craig Afterlea and Clinton-Overland (CI5345). Most of the selections obtained were late in maturity and susceptible to diseases; one early stiff-strawed selection from the cross with Clinton-Overland has however been obtained. The stiff-strawed lines are being back-crossed to Mo.O–205. Back-crossing to incorporate the genes *B* and *C* for stem-rust resistance in Mo.O–205 is in progress. This variety was also crossed with suitable strains in order to improve its quality. Selections highly resistant to crown rust were obtained from F_3 Columbia x Marion.

Barley. The recently-released variety Mo.B–475 (Admire x Early Beardless), superior to Mo.B–400 in yield, winter hardiness and clean threshing, is resistant to the common races of *Ustilago nuda* and *U. nigra* and moderately resistant to mildew.

Maize. The yellow hybrid Mo.845 [(WF9 x Oh.7A) x BIO x CIO3)], superior to US13 in yield and resistance to lodging and ear dropping, was released. CI64, resistant to *Helminthosporium turcicum*, was substituted for the susceptible K64 in two commercial white hybrids.

Breeding for high content of amylose is receiving attention. A strain with 37–40% amylose content was isolated from the open-pollinated variety Cassel. This strain was crossed with a strain from Purdue having a content of 47%; since the genes for high amylose content in these strains do not appear to be allelic, the development of maize with a content above 47% is possible.

The double-cross "pipecorn" hybrids Mo-Pipe 4, 6 and 8 are to be released.

Progress was made in isolating inbred lines resistant to *Helminthosporium turcicum* and *H. maydis*. Some inbreds showed a high degree of resistance to earworm, inheritance of resistance in single crosses being intermediate.

The gene *Ga* for cross sterility is being transferred to white lines with the aim of preventing contamination by yellow maize in hybrid production. Cytoplasmic male sterility and pollen-restoring genes are being introduced into white and yellow lines.

It is stated that in inducing mutations X radiation causes no change in the gene itself but only deficiencies and rearrangements. Ultraviolet treatment, on the other hand, induced in the same stocks mutants which, except for their failure to revert, resembled the type of mutants occurring spontaneously or induced by what are termed hereditary agents. Four independent hereditary agents regulating the mutability of A_1 have been discovered. According to the agent present, the frequency of mutation at this locus may be increased or suppressed by a factor of several thousands. The mutable gene bz_2 has been located on chromosome 1 between *An* and *Gs*. In the study of the genetics of anthocyanin synthesis, progress has been made in developing suitable techniques for aseptic cultures of aleurone tissue, in order to facilitate the identification of the end products of gene action.

Rice. The early medium-grained variety Mo.R–500 was released (cf. Abst. 561). Crosses were effected to incorporate improved characters of the straw in adapted early varieties.

Lespedeza. Breeding continued. Very early strains of *L. striata* were found in an introduction from Korea.

Water melon. Hybrid lines combining the commercial qualities of Black Diamond with the *Fusarium*-wilt resistance of Missouri Queen have been obtained. Progress has been made in introducing anthracnose resistance into these lines. Development of an ice-box type resistant to *Fusarium* wilt continued. Royal Golden was used as a parent with the purpose of imparting its golden rind colour to a type suitable for domestic gardens.

Soya bean. Breeding material from which will be developed a range of varieties having suitable maturation periods for all the different parts of the state and resistance to bacterial pustule and wild fire is now available. These soya beans are also expected to equal or surpass current commercial varieties in other respects. The inheritance of seed-coat colour, sinuous leaf, plant habit and maturity has been studied. An attempt to obtain disease-resistant mutants by irradiation (unspecified) was initiated.

2649 **Progress in Agriculture. 67th Annual Report of the New Mexico Agricultural Experiment Station, 1955-56** (1956) : Pp. 68.

Brief reports are given of breeding work carried out with wheat, sorghum, pecans and onions, and varietal trials are reported of the following crops: wheat, oats, maize, barley, sorghum, lucerne and other legumes, potato, sugar beet, grape rootstocks, safflower, tomato, beans and sweet corn.

Lucerne. A new synthetic variety, New Mexico 16–1, has given good results in tests of tolerance to *Therioaphis maculata* and is being increased. Its parentage includes Lahontan, New Mexico Common and Hardistan (cf. Abst. 1373).

Cotton. Progeny testing of breeding stocks resistant to *Verticillium* wilt has continued, some of the lines in the preliminary and advanced strain tests being found to possess greater wilt tolerance than Acala 1517C. In a test of crosses between six long staple and each of six short staple varieties, hybrids involving Pima 32 as long-staple parent or Acala 1517C as short-staple parent gave the best results. In the first generation of seedlings from X-irradiated and thermal-neutron irradiated seed, rate of germination and growth were reduced by all treatments although no effect on total germination was found. Very few plants from thermal-neutron irradiated material reached maturity but plants from X-irradiated material did so although maturity was greatly retarded. Abnormal plants, many of which were sterile, were found after treatment with 20,000 r. and 30,000 r. but no bacterial-blight resistant mutants were produced.

A variety resistant to race 1 of *Xanthomonas malvacearum* has been developed and released as 1517BR. Breeding for resistance to race 2 is continuing since some increase in the prevalence of race 2 has been detected over the last three years.

Chilli. Selection and testing within the variety Rio Grande have continued and the strains finally selected give yields approaching those of Improved 6. Two selections from strain 46 are undergoing trials in northern and central New Mexico. The first, Sandia A, compares favourably with the local varieties in respect of seedling vigour, early maturity and fruit pungency and gives yields exceeding the local varieties by 50–100%. Sandia B has longer fruit than Sandia A and is more pungent but matures more slowly. Disappointing results have been obtained so far from hybrids of Rio Grande and strain 6 with native varieties.

Proboscidea. Selection from native populations for better seed germination, lighter pods, reduced pod claws and higher yields has so far given disappointing results and X-ray and thermal-neutron irradiation has been used to induce variation. Plants from irradiated seed are now under observation.

Pinto bean. Selection of F_2, F_5 and F_6 lines for rust resistance, bacterial blight resistance and other agronomic characters has continued and further crosses between selected lines have been made.

2650 **Agricultural and home economics research progress 1956.** Ext. Misc. Publ. Inst. agric. Sci. St. Coll. Wash. 1956 : unpaginated.

In addition to the breeding work reported below varietal trials have been carried out with the following crop plants: wheat, oats, rye, maize, barley, cocksfoot, ryegrass, *Agropyron* spp., lucerne, potato, blueberry, cranberry, broccoli, squash, pea and sweet corn.

Wheat. Two new varieties were released during 1955. Omar is a red-chaffed club variety which gives yields equal to or greater than those of Elgin or Elmar and is highly resistant to *Uromyces tritici*. Columbia is a hard red winter wheat released jointly by Washington and Oregon. A high-yielding hard white winter wheat selection, 29–15 x Rio-Rex selection 41,

which is highly resistant to *Tilletia* spp., is being increased for possible release and Orfed x Hybrid 50–3 for commercial-scale milling and baking tests.

A number of lines among the spring wheat selections under trial were found to be resistant to *U. tritici* but none of these are outstanding in respect of yield. Progress has been made in the transfer of bunt resistance from *Agropyron* spp. to Elgin.

The inheritance in *Ustilago avenae* of the ability to infect two wheat hybrids is under investigation.

Barley. Two selections involving White Winter and Rufflyn are superior to commercial varieties. Some off-type plants, produced by irradiation of White Winter, Olympia, Montcalm and Hannchen, show stiffer straw and earlier maturity than the varieties from which they are derived.

Potato. One seedling has been selected which shows only very slight infection by the leaf-roll virus. Crossing is being carried out, using Netted Gem as the female parent, with a view to determining how much leaf-roll resistance can be bred into new varieties. Some variation in palatability to insects between crosses has been observed.

Raspberry. The red raspberry selection WSC156 has proved equal or superior to commercial varieties in respect of yield and processing qualities and shows superior adaptation to heavy soils. Promising plants have been selected from among seedlings from crosses made in 1952.

Strawberry. A selection showing resistance to *Phytophthora fragariae* is to be propagated for release and foundation stock of Northwest has been released to growers. Several commercial varieties and breeding lines have been tested for resistance to the cyclamen mite, *Tarsonemus pallidus*, with a view to investigating the mode of inheritance of resistance and the possibility of breeding for resistance.

Grape. Two rootstocks show promise, Constantia and Mourvèdre x rupestris 1202.

2651 Trabalhos técnicos realizados em 1955 e programados para 1956 pelo Instituto Agronómico do Leste. **(Research work carried out in 1955 and planned for 1956 by the Agronomic Institute for the East).**
Bol. téc., Bahia 1956 : **3** : No. 1 : Pp. 79.

The work referred to in the genetics section includes studies of selfing and crossing in cashew (*Anacardium occidentale*) and the production of varieties resistant to anthracnose; rubber crosses designed to introduce resistance to *Dothidella ulei*; and cacao crosses to introduce resistance to *Phytophthora palmivora*.

2652 El MAC y la investigación agrícola. **(The Ministry of Agriculture and Livestock and agricultural research).**
Agricultor venezol. 1956 : **20** : 184–85 : 28–29.

Some of the main achievements of the Agricultural and Animal Breeding Experimental Station in Venzuela since its establishment in 1938 are surveyed briefly and include the development of maize hybrids, the production of high-yielding strains of sesame, groundnut and beans and testing and distribution of introduced potatoes and cotton.

2653 Heath, R. G.
Annual Report of the Department of Agriculture, Federation of Malaya, for the year 1955 (1956) : Pp. 100.

Rice. Varietal trials have been continued at localities throughout the Federation and recommendations made, based on the results of these trials. Selection within F_2, F_3, F_4, F_5 and back cross progeny of *indica* x *japonica* hybrids and from F_3 and F_4 progeny of hybrids between local varieties has continued. A cytological study of *Oryza ridleyi* has been carried out. Progeny of X-irradiated Siam 29 is under observation and the production of polyploids by means of colchicine treatment is being attempted. An investigation of the extent of natural cross pollination has been initiated.

Cacao. Extensive trials have been continued of selections of Trinitario, Amelonado and Upper Amazon from various sources. Over 1000 controlled pollinations have been made to produce hybrid progeny for trial at Jerangau. A breeding programme involving crosses among the best Trinitario, Amelonado, Criollo and Upper Amazon trees has been initiated.

Oil palm. A series of controlled pollinations between selected palms of various types has been initiated. Details are given of the yields of several "Elimina" selections and of dumpy x semidumpy and semidumpy x semidumpy selections. Cytological studies have been carried out with Deli, *tenera* and *pisifera* palms. Root tip mitosis was normal in the case of Deli and *tenera* but in *pisifera* the occurrence of slow and incomplete separation of chromosomes was noted. A connection between this condition and the sterility shown by some *pisifera* palms is tentatively suggested.

Coconut. The collection of open-pollinated seed from selected trees at the old Port Swettenham Station has continued.

Pineapple. Selections have been made from clones of Singapore Spanish on the basis of yield records and from clones of Sarawak on the basis of agronomic characters in general. Sarawak has been found to be resistant to fruit collapse, caused by a species of *Erwinia*.

2654 **Report of the Waite Agricultural Research Institute, South Australia, and associated activities of the Commonwealth Scientific and Industrial Research Organization 1954-1955** : Pp. 74.

Wheat. A large collection of varieties is being assembled for study of morphological and physiological characters, in connexion with the proposed emphasis on quality in breeding.

Barley. Information gained from a study of 800 varieties made possible the choice of parents for genetical and breeding work on the components of yield and quality in fodder and malting barleys. Chromosome numbers in *Hordeum* spp. were determined.

Cocksfoot. Many strains of *Dactylis glomerata* var. *hispanica*, chiefly from the Mediterranean region, were tested, since a perennial grass for the drier areas in South Australia is required. Selections were made for regional testing. It is expected that the development of the best adapted types may involve hybridization between Mediterranean and northern European forms.

Diploid plants were found in a strain from Israel and hexaploids in an introduction from Egypt.

Phalaris tuberosa. Selfing continued with a view to the possible exploitation of hybrid vigour in combinations between inbreds.

Danthonia. The genus was studied with respect to chromosome numbers and cytotaxonomy.

Linseed. Material showing field resistance to rust and superiority in yield over Walsh and Punjab included selections of Punjab x Walsh.

Safflower. Progress was made in breeding improved varieties for production of drying or edible oil. The inheritance of low iodine index, flower colour and rust resistance and other agronomic characters was investigated.

56th Annual Report of the Bureau of Sugar Experiment Stations, Queensland, 1956 : Pp. 102.

2655 *Buzacott, J. H. Division of cane breeding.* (*pp. 56–67*).

Sugar cane. Improvements were made in the framework and fabric of the breeding lanterns. The biparental combinations and polycrosses effected are listed. In an initial experiment on the photoperiodic control of flowering, CP29/116 produced arrows three weeks earlier than under normal conditions. Selection of varieties suitable for cultivation on very rich land without lodging continued. I233 and L469 show promise for this purpose; the parentage of the latter is Trojan x Q27. The following $2n$ counts were made by means of leaf-tissue smears: *Saccharum spontaneum* '51NG2' and '51NG25', 80; *S. spontaneum* '51NH26', 80–82; *Miscanthus floridulus*, 38; *S. officinarum* 'Q13' and 'Q44', 80; *S. robustum* '51NG91', 162; and 51NG88 (unclassified), 158. The commercial status of different varieties in Queensland is analysed. Several additions to the Q series of varieties have been approved or are undergoing propagation prior to approval in the near future.

Leguminous cover crops. Cowpea varieties were crossed, the parents being Groit, Poona, Reeves, and several introductions, including Malabar Pea and Blackeye 5. In tests of the reaction of cowpea varieties to bean fly (*Agromyza phaseoli*), Clay Pea displayed resistance. Varieties of cowpea, including Giant, all had $2n = 22$. Hybridization of velvet bean (*Mucuna* spp.) is shortly to be undertaken.

2656 Hudson, J. P.
Control of plant environment for experimental work and notes on environmental control equipment in use in Britain.
Misc. Publ. Univ. Nott. Dep. Hort. 1957 : No. 8 : Pp. 30.

A survey is given of the equipment and installation now being used to control temperature, light, relative humidity of the air and other environmental factors in experiments on plants in university departments and national and industrial research organizations in Great Britain. Some of the departments and organizations referred to are engaged in crop breeding.

2657 Gončarov, B. P. & Šlimovič, B. M.
(The prospects of using semiconducting instruments in breeding and seed-production work).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 5 : 14–19. [Russian].

The pieces of apparatus described include a microelectrothermometer for measuring the temperature of a plant and electrothermometers for grain stores, one of which gives a signal if certain maximum and minimum temperatures are exceeded.

2658 Zimmermann, K.
Die Organisation der Sortenwertprüfung, der Sortenzulassung und der Saatenanerkennung in Ungarn. (**The organization of varietal trials, variety registration and seed certification in Hungary**).
Dtsch. Landw., Berl. 1957 : **8** : 86–90.

A review is given of the origin, subsequent development and organization of the National Institute for Research on Plant Varieties, Budapest. Emphasis is laid on variety trials and the selection of improved strains of crop plants and the institute is also responsible for the inscription of varieties in the official list and for seed certification.

2659 Cicin, N. V.
(**I. V. Mičurin and the importance of his theory in modern biology**).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1956 : No. 25 : 3–14. [Russian].

In this address the speaker emphasized the fact that Mičurin developed his theory on the basis of Darwinism, not in opposition to it; both, it is pointed out, ascribed great importance to distant hybridization and the work on *Triticum-Agropyron* hybrids carried out by the speaker and his colleagues is then briefly referred to (cf. *PBA*, XXVI, Absts. 274–94).

2660 Parkin, A.
La agricultura en la utilización pacífica de la energía atómica. (**Agriculture in the peaceful uses of atomic energy**).
Agricultor venezol. 1956 : **20** : No. 186 : 32–33, 41.

Reference is made to the production of some promising mutants of wheat and barley at Cambridge, England, and to the use of radioactive cobalt to produce bud mutations in Scandinavia.

2661 Czu, D.-M. [Tsu, T.-M.] & Ljaėn, Č.-N. [Liang, C.-N.]
(**The first achievements of the Mičurin theory in China**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. biol. : 1956 : No. 4 : 129–35. [Russian].

Some 1300 improved varieties of agricultural crops have been selected, special mention being made of some of the most successful varieties.
The wheat Pi-ma 1, produced by Mičurinist methods, has high yielding capacity, strong straw and a high degree of rust resistance. A very successful cotton with long lint has been produced by crossing perennial with annual cottons. Yield increases have been obtained by intravarietal crossing and by pollination with mixed pollen from a number of varieties. The yield of maize has been raised by 5% and more by supplementary pollination, and by amounts varying from 41 to 77·7% by the use of intervarietal hybrids. In rice, yield increases of 3·5–20·7% have been attained by intervarietal pollination using mixed pollen from four varieties, and increases of 2·3–27·5% by intravarietal crossing.
Seven spring wheats have been converted into winter varieties, two of which withstand temperatures of −36° C. The late-maturing long-linted cottons of eastern China have been made two months earlier by grafting on to the early variety Tai 14.
Vegetative hybrids have been obtained also with egg plants and tomatoes.
A study has been made of phasic development in 168 wheat, 21 rice and 12 cotton varieties grown in different parts of China. Vernalization has been applied successfully to garlic, cotton, rice and potato.
Examples are also quoted of the use of vegetative hybridization in domestic animals.

2662 Villax, E. & Pinheiro, J. C.
A acção do meio sobre as variedades homozigóticas. (**The action of environment on homozygous varieties**).
Melhoramento 1956 : **9** : 5–23.

Clear morphological and other differences were established between peas, all belonging to the variety Express but differing in provenance. The differences were thought to be the result of the combined effect of environment as a mutagenic and a selective agent. To test this, the seed from homozygous plants of van Hoek wheat, Mansholt's two-rowed barley and Binder oats was divided into three lots, which were sown for several years in the Netherlands, Sweden and Portugal respectively and then grown on for one year in Portugal. The wheat from seed reproduced in the Netherlands had a lower tillering capacity, eared and matured earlier and gave a higher yield than the other two lots. For the barley the tillering and yield were highest from the lots reproduced in Portugal and for the oats from those reproduced in Sweden. The superiority in the oats was retained in two successive generations grown on in Portugal.

2663 Bukovac, M. J. & Wittwer, S. H.
Gibberellic acid and higher plants. I. General growth responses.
Quart. Bull. Mich. agric. Exp. Sta. 1956 : **39** : 307–20.

The effect of gibberellic acid on a number of

crop plants has been observed at Michigan State University and in all cases a marked and rapid elongation of internodes was found to occur. The most striking results were obtained with genetically dwarf pea varieties, which grew taller than normal varieties, and with bush type beans, which developed the twining habit of pole or runner beans.

2664 Frahm-Leliveld, J. A.
Spontaneous vegetation and future selection work in the tropics.
Netherlands J. agric. Sci. 1957 : **5** : 1–3.

In view of the widespread and increasing impoverishment of indigenous floras, the author advocates the establishment of collections under international management in different climatic zones of the tropics, in order to preserve material likely to be useful to the breeder.

2665 Olssen, G. & Ellerström, S.
Report on a plant collection expedition in Mediterranean countries in the summer of 1956.
FAO UN, Rome 1956 : Circ. No. Pl. Explor./1/57 : Pp. 13. (Mimeographed).

The authors give a report of their expedition to Italy, Greece, Turkey and Yugoslavia, where they obtained wild forms, land races and bred varieties likely to be of use in crop improvement in Sweden. Special attention was paid to the genera *Brassica, Sinapis, Beta, Hordeum, Triticum, Phleum* and *Dactylis.*

2666 Singh, H. B.
Plant introduction reporter—II.
Bull. Indian Coun. agric. Res. No. 76 : Pp. 42.

Notes are given on the origin and characters of foreign and indigenous collections made during the period December 1948 – December 1949 and studied at the Indian Agricultural Research Institute and other stations. As in the previous annotated list, cereals, pulses, oil plants, vegetables and several other kinds of crops are included (cf. *PBA*, XX, Abst. 2194).

2667 Kuljtiasov, M. V.
(I. V. Mičurin, the originator of the historical method in plant introduction).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1956 : No. 25 : 29–36. [Russian].

The importance attached by Mičurin to environmental conditions is recalled; this led him to study the conditions under which any species he wished to acclimatize had evolved. Experiments at the Main Botanic Garden, Moscow, have shown that some plants when transferred from extreme to more equable conditions become more productive and the difference is then transmitted to succeeding generations. Thus lucerne from the arid Kara Tau, after growing in Moscow for three generations, gave a seed yield of 265 g. from a plot of 2·5 m². whereas a similar sized plot from seed introduced direct from the Kara Tau gave only 120 g. In the sixth generation the acclimatized plants differed from those from directly introduced seed in having a lower transpiration rate per gramme of dry matter and a lower osmotic pressure; the rate of water loss as a percentage of fresh weight was greater.

2668 Grebenskiĭ, S. R., Burlak, A. I., Rubanjuk, E. A. & Skorohodova, I. A.
(The effect of fertilizers upon the dominance of characters in wheat and tomato hybrids).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1956 : No. 1 : 47–54. [Russian].

The mode of segregation of hybrid progenies of wheat was slightly modified with regard to ear characters by giving the F_1 varied fertilizer treatments. Similar observations on the effect of nutrients upon morphological characteristics of the fruits in the tomato hybrid Gibrid 172 [Hybrid 172] x Bison are reported. In the case of the tomato, the different parental forms were given fertilizer treatments before crossing. Most tomato hybrids showed heterosis for yield.

2669 Kružilin, A. S. & Švedskaja, Z. M.
(Influence of the conditions of mineral manuring on changes of properties in plants).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1956 : **17** : 436–42. [Russian].

Tomatoes grown for five successive years with high N dressings exceeded the controls and those grown with high dressings of P in content of oxidizing enzymes (peroxidase and polyphenoloxidase), ascorbic acid, sucrose and protein. Plants of the first and second seed generation of plants so treated, when grown under normal conditions of manuring retained a somewhat higher content of sucrose and protein but in respect of enzymes and ascorbic acid were somewhat lower than the controls. The plants with high P were earlier than the control plants and than those with high N and this difference was transmitted to the first generation offspring. The yield of fruits was 20–30% greater than the controls in the F_1 and F_2 from the high P plants and 30–40% lower in those from the high N. In similar experiments with potatoes, the peroxidase was reduced in the plants with high N

and in their tuber progeny, as was the sucrose content; the tuber yield was greater in the treated plants but slightly lower in the progeny. Plants with high P and their progeny flowered earlier than the controls; the treated plants were slightly higher in tuber yields but the progeny were considerably lower. In all the experiments hybrids showed more pronounced differences than old-established varieties.

2670 Boerger, A.
Tópicos de la genética de la inmunidad vegetal en el Río de la Plata. (**Themes of the genetics of plant immunity in the Río de la Plata region**).
Sci. genet. 1952 : **4** : 129–48.

The substance of this article has been dealt with in the works referred to in *PBA*, XXIII, Abst. 1014 and XXVII, Abst. 1486.

Plant diseases conference held at Hawkesbury Agricultural College, New South Wales, June-July, 1955.
CSIRO, Melbourne 1955 : **1** : Pp. 308. (Mimeographed).

2671 *Magee, C. J. Review of major changes in the plant disease position from new introductions or extension of those diseases present before the 1949 conference.* (*pp. 7–18*).

The survey includes information on the recent distribution of races of stem and leaf rusts of wheat and stem and crown rusts of oats in Australia.

2672 *Purss, G. S. Stem rot of cowpea.* (*pp. 21–22*).

Blackeye 5, Chinese Red and an unnamed Cuban introduction have displayed a high degree of resistance to *Phytophthora* stem rot in greenhouse tests.

2673 *Macindoe, S. L. & McWhirter, K. S. Recent advances in principles of breeding and selection for disease control in crops other than cereals.* (*pp. 90–99b*).

The authors give a general review of some recent work on breeding for disease resistance in potato, flax, sugar cane, tobacco and tomato. Sources of resistance, variability in the pathogen and the application of genetics in devising breeding methods are discussed.

2674 *Walker, J. Production of an anthracnose-resistant line of the French bean variety Brown Beauty.* (*p. 100*).

A line of Brown Beauty resistant to strain 1 of *Colletotrichum lindemuthianum* has been selected.

2675 *Johnson, J. C. Breeding for disease resistance in the French bean.* (*pp. 101–03*).

This short survey deals mainly with work in Queensland. A variety of the Brown Beauty type has been developed by repeatedly back crossing rust-resistant hybrids of Brown Beauty x California Small White to Brown Beauty selections resistant to one strain of anthracnose and to bean mosaic. Combining resistance to these three diseases, the variety is shortly to be released. Breeding continues with the aim of adding resistance to a second strain of anthracnose and to angular leaf spot. Stringless beans resistant to rust are being developed without back crossing, Burpee's Stringless Green Pod and Florida Belle being used as resistant parents.

2676 *Pugsley, A. T. Modern advances in principles of control of cereal rusts.* (*pp. 104–08*).

A short review of pioneer work leading to modern methods of breeding cereals for rust resistance is followed by an outline of some recent research on the modes of origin of genetic diversity in the pathogens. Genetical problems of resistance requiring analysis are indicated. By back crossing, strains of the wheat Insignia, with genes for rust resistance from one, two or three sources, have been developed at the Agricultural Research Institute, Wagga, NSW, using Gabo as donor of stem-rust resistance and Kenya C6041 and Uruguay 1064 as donors of leaf-rust resistance. Additional stem-rust resistance is being transferred to these lines from Kenya 112A, Kenya 117A and an *Agropyron* derivative (PW357–5); still further extension of this range of resistance is planned.

2677 Suhorukov, K. T.
(**The role of protective substances in producing immunity in plants**).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1956 : No. 25 : 53–57. [Russian].

A number of antibiotic substances known to occur in plants are referred to; they include various phenolic substances and pigments, mustard oils, alkaloids, tannins and terpenes. The writer points out however the danger that the pathogenic organism may acquire resistance to the toxic substance and in many cases may even become dependent on it.

2678 López Campos, G.
Importancia de la creación de variedades más tolerantes de la sequía. (**The importance of creating varieties with greater drought tolerance**).
Agricultura, Madr. 1956 : **25** : 481–84.

The need for breeding drought-tolerant crop plants in Spain is discussed, the methods advocated being the selection of tolerant forms

from Spanish material and the use of cultivated and wild varieties and species from arid countries as sources of genetical resistance. Selection criteria and testing procedures receive brief mention.

2679 **Pathology Department reports studies on plant diseases and weed control.**
Miss. Fm. Res. 1956 : **19** : No. 9 : p. 2.

The annual report of the Department of Plant Pathology, State College, Miss., includes the following items of interest to plant breeders.

Oats. Selections combining superior grain and forage qualities with resistance to *Puccinia* spp. and *Helminthosporium victoriae* are undergoing trials at several localities in Mississippi.

Maize. A large number of hybrids have been tested for reaction to *Physoderma zeae-maydis* and a few were found to possess considerable tolerance. A number of inbred lines were screened for resistance to *Helminthosporium carbonum* and *Gibberella zeae.*

Cotton. Strains of upland cotton tolerant to infection by *Verticillium albo-atrum* have undergone further trials. Genetical studies of *Verticillium* tolerance in Upland cotton and in *Gossypium barbadense* have been started. A source of resistance to root-knot nematodes has been discovered and this, together with resistance to *Xanthomonas malvacearum,* has been incorporated in the breeding programme. The resistance to *Fusarium vasinfectum* possessed by Upland cotton is being transferred to wilt-susceptible commercial varieties.

Pepper. It has been shown that the root-knot nematode resistance discovered in a wild pepper species is controlled by a single gene pair in the case of one species of nematode and either the same or a closely linked gene pair for a second species. This pepper species possesses resistance to four of the five species of root-knot nematode occurring in the USA, including the two species most common in Mississippi.

Pea. Over 500 lines from other countries have been screened for resistance to *Ascochyta* spp. and seed of Austrian Winter was subjected to X rays and ultraviolet irradiation at the Brookhaven National Laboratory in an attempt to induce resistance.

2680 McGinnis, R. C.
Cytological studies of chromosomes of rust fungi. III. The relationship of chromosome number to sexuality in *Puccinia*.
J. Hered. 1956 : **47** : 255–59.

Observations on haploid cell division in sporidia of various *Puccinia* species showed that the homothallic species *P. malvacearum, P. xanthii* and *P. asteris* had $n = 4$, the chromosomes often being joined to give ring configurations, while among the heterothallic species, *P. coronata* var. *calamagrostis* had $n = 3$ and *P. sorghi, P. carthami* and *P. helianthi* $n = 6$.

2681 Flentje, N. T. & Saksena, H. K.
Studies on *Pellicularia filamentosa* (Pat.) Rogers. II. Occurrence and distribution of pathogenic strains.
Trans. Brit. mycol. Soc. 1957 : **40** : 95–108.

The results of tests carried out with isolates of *P. filamentosa* (*Rhizoctonia solani*) from soil from several localities in England and Australia indicate that a large number of strains of varying pathogenicity exist. Some strains are pathogenic to a wide range of crop plants, others are specific to hosts from one family. A strain specific to Crucifers was isolated from all but one of the soil samples. No cultural or physiological features were found which could consistently be used to distinguish between the different pathogenic strains.

In the case of *P. praticola* no specialization was found, a wide range of hosts being attacked at temperatures above 18° C., although below this temperature only beet was attacked. (Cf. *PBA,* XXIII, Absts. 1765–6).

CEREALS

2682 Bell, G. D. H.
Cereal breeding.
Sci. Progr. 1957 : **45** : 193–209.

Some of the improvements achieved by cereal breeding in Britain over the last 20 years are described and methods and future prospects are discussed.

2683 **Bibliography of articles, reports and scientific papers by members of staff 1919-1955.**
Welsh Plant Breeding Station, Aberystwyth 1956 : Pp. 98.

Alphabetical and chronological lists are given of publications reporting breeding, genetical and other work carried out, chiefly on cereals, grasses and forage legumes, at the above station since its establishment in 1919.

2684 Lelley, J.
A magyar gabonanemesítés eredményei és feladatai. **(The tasks and results of Hungarian cereal breeding).**
Agrártudomány 1955 : **7** : 477–81.

Tabulated data are given on the breeder's name and place of breeding of all the 26 Hungarian

cereal varieties registered or provisionally approved up to April 1955, including six varieties of winter wheat, two spring wheats, four ryes, nine spring barleys, three winter barleys and two oat varieties.
Further aims of wheat breeding are the increase of drought, rust and bunt resistance; and of rye breeding, the increase of drought resistance and the improvement of quality by hybridization with wheat. The importance of winter barley is increasing, but the winter hardiness is not yet sufficient. New oat varieties are needed, with earlier and more uniform maturity.
The aim to be achieved concerning all cereals is resistance to lodging to make them adapted to mechanical harvesting. A special problem of wheat breeding is to ensure that flour quality is good when the wheat is harvested at the over-ripe stage.

Expérimentation sur céréales 1950–1955. (**Testing of cereals, 1950-55**).
Bull. tech. Ing. Serv. agric. 1956 : No. 114 : 573–769.

2685 *Mayer, R. & Jonard, P. Résultats des essais conduits par les stations d'amélioration des plantes de l'Institut National de la Recherche Agronomique sur les variétés de céréales.* (*Results of trials carried out on cereal varieties by the plant breeding stations of the National Institute of Agronomic Research*). (*pp. 573–76*).
New varieties of wheat, oats and barley accepted into the official French catalogue of approved varieties since 1948 on the basis of trials carried out by plant breeding stations under the control of the National Institute of Agronomic Research are listed, together with information on sources from which seed may be obtained.

2686 *Fosseux, G. de, Simon, M., Guimbard, C. & Verbiest, R. Détermination de la valeur agricole des variétés de blé d'automne et de printemps, cultivées dans le Bassin Parisien et le Nord-Est de la France.* (*Determination of the agricultural value of winter and spring wheat varieties grown in the Paris Basin and in north-eastern France*). (*pp. 577–608*).
Tabulated data are presented on the yield, reliability of yield, degree of tillering, fertility, 1000-grain weight, baking quality, number of days to maturity and resistance to lodging, frost, *Ustilago tritici* and *Puccinia* spp. of some 70 varieties of winter, spring and alternative wheats grown in the Paris Basin and in north-eastern France.

2687 *Cauderon, A., Fosseux, G. de & Guimbard, C. Les variétés d'orge cultivées dans le Bassin Parisien.* (*Barley varieties grown in the Paris Basin*). (*pp. 609–16*).
Information is provided on the yield, period to maturity, quality of the grain and resistance to diseases and lodging of the principal varieties of fodder and malting barleys grown in the Paris Basin.

2688 *Moule, C., Fosseux, G. de & Guimbard, G. Productivité, régularité de production et qualité des variétés d'avoine de printemps.* (*Productivity, yield regularity and quality of spring oat varieties*). (*pp. 617–28*).
Data on the yield and quality of the grain and straw, period to maturity and resistance to lodging, *Oscinella frit*, *Puccinia coronata*, *Erysiphe graminis* and *Ustilago avenae* are presented for the principal varieties of spring oats grown in France.

2689 *Koller, J., Heinen, A. & Laramberge, R. de Expérimentation de variétés de céréales dans la région de l'Est-Central et en Alsace.* (*Testing of cereal varieties in the East-Central Region and in Alsace*). (*pp. 629–47*).
The results of variety trials of wheat, oats and barley carried out under the auspices of the Dijon Plant Breeding Station in eastern France in 1951–55 are presented.

2690 *Paquet, J. & Plumet, H. Expérimentation de variétés de céréales dans la région du Centre et du Massif-Central.* (*Testing cereal varieties in the Central Region and in the Massif Central*). (*pp. 649–80*).
The results of cereal trials are tabulated.

2691 *Cotte, A. & du Créhu, G. Expérimentation sur les céréales dans la région de l'Ouest. Période 1950–55.* (*Cereal trials in the Western Region. 1950–55 period*). (*pp. 681–96*).
The results of trials of wheat, oats and barley at a number of different centres and on different types of soil are presented, together with notes on grain quality.

2692 *Chevalier, R. Les variétés de céréales d'hiver dans les régions méridionales (1952–1956).* [*Winter cereal varieties in the southern regions (1952–56)*]. (*pp. 697–751*).
Brief descriptions, including information on grain quality and resistance to diseases and lodging, are given for varieties of winter wheat, barley and oats grown in southern France.

2693 *Grignac, P. Les variétés de blé dur dans la région méridionale.* (*Varieties of hard wheat in the southern region*). (*pp. 753–61*).

On the basis of variety trials held in 1952–55, tabulated data are provided on the yield, extent of tillering, length of straw and resistance to lodging, 1000-grain weight, grain quality, degree of susceptibility to mealy endosperm and resistance to diseases and frost of some 40 varieties of hard wheat grown in southern France. Bidi 17 and Oued Zenati 368 gave the best all-round results.

2694 *Jonard, P. Étude critique de quelques techniques culturales pouvant être appliquées au blé dans la moitié Nord de la France.* (*Critical study of some cultural techniques capable of being applied to wheat in the northern half of France*). (*pp. 763–69*).

Problems caused by the introduction of new high-yielding varieties that are more exacting in their cultural requirements are discussed, with reference to the use of fertilizers, irrigation, destruction of weeds and drainage and aeration of the soil.

2695 Kiričenko, F. G.
(Summary of work on breeding of grain crops).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 5 : 3–8. [Russian].

The new wheats Odessa 3 and Odessa 12 produced by the All-Union Breeding and Genetics Institute, Odessa, exceed Ukrainka and the older standards in resistance to bunt, smut, drought and frost and in baking quality; Odessa 16, produced by intravarietal crossing in Odessa 12, is earlier, more drought resistant and has stronger straw; it also stands up better to sudden temperature changes and in many parts of the Ukraine has proved more frost resistant and has yielded 4 c. per ha. more grain. Some promising hybrids have been obtained by allowing the best breeding lines to open-pollinate with Odessa 16; some of these hybrids in the second generation have outyielded Odessa 3 by 2·5–5 c. per ha. and the families showing the greatest uniformity in morphological features have been selected. Some families from interpollination of the early-maturing wheat L–3 ripen 7–10 days before the standard, and being as winter hardy as Odessa 3, are thought promising for the Ukrainian steppes. Hybrid populations from Odessa 3 x Odessa 16 surpass the parents in resistance to lodging and low temperatures and in yield exceed Odessa 16 by 2 c. per ha.

Hybrids from crossing the standard varieties of bread wheat with *Triticum durum* when sown in autumn showed a better survival of plants when *T. durum* served as seed parent. The few surviving plants were selected and gave rise to a winter form of *T. durum* roughly equal to Kooperatorka in winter hardiness; it has 28 somatic chromosomes and is indistinguishable in morphological features from typical *T. durum*; it has been back crossed to good winter bread wheats to improve its yielding capacity and winter hardiness and some of the offspring are equal to Odessa 3 in hardiness.

Two winter barleys obtained by conversion of spring barleys when intercrossed gave rise to a winter barley that survived even the severe winter of 1955–56 and yielded 35–40 c. of grain per ha.

2696 Pérez-Navarro y Flórez-Estrada, A.
Memoria de los trabajos realizados por la sección de cebadas y avenas del Centro de Cerealicultura de Madrid en el año 1955. **(Report on work carried out in the barley and oats section of the Cereal Centre at Madrid in 1955).**
An. Inst. nac. Invest. agron., Madr. 1956 : **5** : 447–595.

A collection comprising 2287 varieties of barley and 1452 of oats is being maintained. The results of comparative tests with the varieties most interesting for cultivation in various parts of Spain are presented. Several of the varieties produced by the centre have given good results; these include the barleys Meri, Cerro and Lupe, together with Guadiana produced at one of the subcentres.

[Thirty years' breeding and seed-production work on cereals and grain legumes (1922-1952)].
Vsesojuznyĭ Naučno-issledovateljnyĭ Institut Saharnoĭ Svekly [Sugar-beet Research Institute] Moskva 1956 : Pp. 468. [Russian].

This memorial volume is devoted to the activities of the Soviet Sugar-beet Research Institute and its associated plant-breeding stations in the given period. It contains the following contributions bearing upon plant breeding.

2697 *Maksimčuk, L. P.* (*History of the organization of breeding and seed-production work with cereals and grain legumes*). (*pp.7–23*).

The organization and development of breeding work carried out with cereals and legumes at the different sugar-beet breeding stations of the

Ukraine are described briefly, special emphasis being laid on the close association between seed production and breeding.

2698 *Maksimčuk, L. P.* (*Main problems and characteristics of the plant-breeding work*). (*pp. 23–57*).

The objectives in breeding are enumerated for the main winter and spring cereals, peas and beans. In support of the Mičurinist basis of the work reference is made to the production of the winter wheat Ljgov 873, resistant to brown and yellow rusts, from two susceptible parents. Evidence is quoted to show that what are referred to as "pure lines" can be changed by selection and the importance of the dialectical principle in plant breeding is expounded. The number of years in which a new variety is produced has been reduced from 8–12 to 5–6. A number of methods for determining such properties as hardiness and disease resistance under artificial conditions are described; a list is given of the varieties of winter wheat that are resistant to brown rust, to bunt and to both; other lists show the varieties that have been produced by selection from local races, by hybridization and by open interpollination; vegetative hybridization and conversion from winter to spring forms and *vice versa* have not so far led to the production of any commercially successful varieties.

Experience in variety trials has shown that greater ear number does not always result in higher yield. A full description is given of the methods of carrying out the comparative trials of new breeding material. Student's method is no longer applied extensively and the statistical examination of the results is regarded as only a subsidiary technique; values of P below 5–6 are regarded as unreliable. Great emphasis is laid on releasing the new varieties with as little delay as possible.

2699 *Maksimčuk, L. P.* (*Main achievements of breeding cereals and grain legumes*). (*pp. 57–77*).

The varieties produced by the station that have been approved for cultivation are listed; they comprise 13 varieties of winter wheat, 4 of winter rye, 1 of spring wheat, 3 of oats, 5 of barley, 1 of maize, 5 of millet, 7 of pea and 3 of lentil. Some of these varieties are very widely grown in the Soviet Union, Ukrainka wheat occupying 6 million ha. and Sovetskiĭ oats 3 million. Special mention is made of certain highly successful varieties: thus among the wheats, Erythrospermum 968, from Udača [Success] x a branched wheat, and Lutescens 997, from open pollination of Lutescens 17, have given yields of over 61 c. per ha.; Erythrospermum 198 and Erythrospermum 160 have surpassed the standard varieties in yield and resistance to brown rust and are somewhat better in grain quality; Lutescens 1044, from Milturum 14 x Koveĭl (?Kawvale) has exceeded the standard Lesostepka 75 by 50% in grain yield with 47·8 c. per ha. as against 32·0 c.; the variety Pimenka produced by the main station is also regarded as one of the most promising in yield, quality and resistance to bunt and brown and yellow rust; some of the spring wheats from *Triticum* x *Agropyron* crosses display resistance to brown rust; the oat Verhnjačka 648 exceeds Sovetskiĭ in earliness, resistance to loose smut and yield; and the millet hybrid VNIS–29 (367 x 1843) combines high yield and large grain with almost complete immunity to loose smut. Some improved pea varieties have been produced by what is referred to as "vegetative-sexual hybridization" between pea and broad bean. The yield increases reported by Pisarev and Vinogradova (cf. *PBA*, XXII, Abst. 2632) from mixed sowings have not been confirmed in experiments with buckwheat and rye.

2700 *Kuzjmenko, M. V. & Efimenko, T. M.* (*Breeding winter wheat at the Veselyĭ Podol Plant Breeding Station*). (*pp. 77–96*).

After a brief historical account of the activities of the station reference is made to experiments in which it was shown that pollen from mature anthers gave better sets than immature pollen and that the best results were obtained from pollination in the morning. Several hybrids distinguished by resistance to brown rust (*Puccinia triticina*) have been produced and some of them have proved superior to Lesostepka 75, the standard for the Poltava district, in yield and drought resistance; VP–499 is the most promising.

Hybrids obtained by open intervarietal pollination usually excelled the seed parent in yield and equalled it in rust resistance but in resistance to bunt they were usually inferior; in morphological characteristics 85–95% of the plants resembled the maternal type in the later generations of such crosses; greater yield increases were obtained by open pollination in the middle of the breeding plots, with an indefinite number of pollinating varieties, than with 2, 4 or 8 pollinating varieties.

2701 *Feĭcarenko, A. I.* (*Breeding winter wheat at the Ljgov Plant Breeding Station*). (*pp. 96–103*).

M–40, a variety raised by mixing several

promising breeding lines, has exceeded Ferrugineum 1239, the standard for the Kursk province, by 2·4 c. per ha. and several varieties have been improved by intravarietal crossing. L–873, a hybrid from Ukrainka x Durable distinguished by resistance to lodging and brown rust, is also superior in grain quality and has exceeded the standard by up to 8·6 c. per ha. in yield. Certain newer hybrids excel L–873 in winter hardiness and earliness, and some of them even in yield; one of them, M6–48, is resistant to bunt.

2702 *Maljuta, D. I.* (*Breeding winter wheat at the Ramonj Plant Breeding Station*). (*pp. 103–09*).

Observations on a large collection of wheats from different parts of the world have revealed resistance to rust and mildew in a number of varieties, which are enumerated. Several of the varieties produced by the station exceed the standards for the Voronež province in yield and resistance to brown rust and lodging and are not inferior in cold and drought resistance.

2703 *Larionov, S. P.* (*Breeding winter wheat at the Biĭsk Plant Breeding Station*). (*pp. 109–12*).

Two promising varieties have been raised from free intervarietal pollination.

2704 *Kuljčuckaja, Z. A.* (*Breeding spring wheat at the Ramonj Plant Breeding Station*). (*pp. 112–17*).

A much better set of grain is obtained from open pollination of emasculated ears than from artificial pollination, and by pollination of the local wheat Turka with six other varieties of *Triticum durum* a hybrid was produced which yielded 21·5% more than the standard, Narodnaja [People's].

The best yields of all were given by hybrid 27/49, from (Lutescens 62 x *Agropyron glaucum*) x Caesium 111, which exceeds Lutescens 62 in resistance to smut and is equal to it in grain quality. Hybrid 5043, from (Lutescens 62 x *A. glaucum*) x Kooperatorka, also exceeds Lutescens 62 by 11·6% in yield and is resistant to smut; it is two days later than Lutescens 62 but is equal to it in grain quality.

2705 *Zelenskiĭ, S. S.* (*Breeding oats at the Ljgov Plant Breeding Station*). (*pp. 117–29*).

Two of the hybrids produced have exceeded Pobeda [Victory] in yield by 2–3 c. per ha. and in rust resistance by 26–35%; one of them is earlier and stronger in the straw too. Ljgov 179, a selection from accession 8257 in the Leningrad world collection, exceeds Pobeda by 1–3·6 c. per ha. and is also more resistant to crown rust, bunt and smut. Ljgov 1026, a complex hybrid of Pobeda, Gigant [Giant] and *Avena byzantina*, is characterized by good grain quality, resistance to crown rust and loose smut and a grain yield of 5 c. per ha. above that of Pobeda; its grain is larger and the husk percentage less; it ripens two days earlier but is slightly more susceptible to covered smut.

2706 *Korčenjuk, Ja. T.* (*Breeding millet at the Veselyĭ Podol Plant Breeding Station*). (*pp. 129–49*).

Several lines of *Panicum mileaceum* resistant to smut have been produced by selection.

Low husk percentage was found to be correlated with grain size and selection has been carried out for large grain. The best flavour and cooking quality were found in forms with yellow grains.

Selection of morphologically uniform types from the mixed local populations usually led to a slight fall in yield. Some selections have however proved more productive, the best being Veselyĭ Podol 38, which has exceeded the standard variety 24/273 by up to 4·8 c. per ha. Observations have been made on the floral biology of various forms and subspecies of *P. mileaceum*; the method of crossing now recommended is to shake a number of flowering panicles underneath the emasculated flowers of the variety to be pollinated. Some of the hybrids produced have yielded up to 49·0 c. per ha. of grain as compared with 42·4 c. from the standard.

2707 *Šuljga, M. S.* (*Breeding peas at the Uladovka-Ljulincy Plant Breeding Station*). (*pp. 150–57*).

Varieties improved in yielding capacity or in earliness have been produced by selection from Mahndorf Viktoria and Folger Heine, and from intercrossing these some valuable hybrids were obtained, the best being Uladovka 387, which has surpassed the standard by up to 5·3 c. per ha. in seed yield. Uladovka 208 and 460 have twice as much protein in their seeds as Mahndorf Viktoria and 208 is distinguished also by good flavour and cooking quality.

2708 *Maljuta, D. I.* (*Breeding peas at the Ramonj Plant Breeding Station*). (*pp. 158–63*).

The best varieties in the collection in respect of earliness and yield are enumerated.

The first seed generation from *Pisum vulgare* var. *vulgatum* 'P–77' grafted on to *P. sativum* var. *medullare* 'P–626' comprised 16 plants of the maternal type and 74 displaying deviations from the parental types in various ways. P–77 was produced from Viktoria Heine x A–579 MSS

and is distinguished by its adaptability to a wide range of conditions and tolerance of spring frosts. P–626 is a hybrid of American Wonder x Mahndorf Viktoria x American Wonder and is suitable for canning on account of its uniform ripening.

2709 *Maksimčuk, L. P.* (*Seed production of cereals and grain legumes*). (*pp. 163–89*).
The importance of cultural conditions in growing crops for seed is recognized and some cases are cited in which properties such as rust resistance and yielding ability have been improved in the course of seed production; these cases were however exceptions and in general little or no difference could be detected between the yields of the élites and the following generations, and all attempts to remove the defects of varieties such as Ukrainka and Odessa 3 wheat, Victory and Golden Rain oats and many others by adequate seed production have palpably failed. It is submitted therefore that the object of seed production should be to maintain the qualities of a given variety and not necessarily to improve them, which is the task of the plant breeders. The scheme of seed production applied is described; it includes free intravarietal pollination, sometimes between lots of seed reproduced in different localities, or in winter and spring sowings.

2710 *Maksimčuk, L. P. & Maksimčuk, I. H.* (*Floral biology and technique of hybridization of millet*). (*pp. 190–216*).
Data are reported which show *Panicum mileaceum* to be largely self pollinated. Detailed descriptions are given of the morphology of the spikelets and floral organs, of their development, the processes of flowering and fertilization and the technique of emasculation and hybridization; pollination is effected by shaking portions or whole flowering panicles from several plants of the pollen parent under the emasculated flowers of the seed parent or rubbing these with several ripe anthers from different flowers.

2711 *Lysak, S. A.* (*Production of intervarietal hybrids of millet by free selective fertilization*). (*pp. 217–23*).
Although millet is predominantly self pollinating, natural hybrids have been found in several varieties. By sowing alternating rows of different varieties and emasculating some of the flowers, 43–46·7% of them set seed when left to open pollination, though only 0–3·3% set when bagged. Some 47% of the plants obtained from the open-pollinated seeds proved to be hybrids. This method is considered preferable to artificial hybridization for producing hybrids in plant breeding work.

2712 *Golovcov, L. A.* (*Vegetative hybridization of cereals*). (*pp. 223–46*).
The method described consists of cutting off the tip of the dry grain, wetting for 24–30 hr. and removing the endosperm, leaving only the embryo with the empty shell, into which the dry endosperm of the other variety is then introduced after removal of the embryo; it swells on absorbing moisture and thus effects a complete union.
Scions of the spring wheat Caesium 111 grafted in this way on to the winter wheat Ukrainka proved more frost resistant than Caesium 111 ungrafted and 24% of them survived a temperature of −10° C.; the next generation from these plants survived −10–14° C. and segregated for ear colour.
Grafts of embryos from vernalized grains of Ukrainka on unvernalized endosperms grew more slowly and were later in development than the controls grafted on vernalized endosperms; development was accelerated when unvernalized embryos were grafted on to vernalized endosperms.
Grains obtained from the cross *Triticum persicum* x Milturum 162 grafted on to the endosperm of the spring wheat Arnautka Nemerčanskaja showed more segregation than the ungrafted hybrids, which resembled *T. persicum*, and many of the segregates resembled *T. durum*.
Other grafting methods employed were transplanting meristematic tissue from one embryo to the other by the method referred to in *PBA*, XXIII, Abst. 1023 or by means of a modified hypodermic needle. In this way tissue of embryo of the spring wheat Lutescens 62 was transplanted into that of the winter wheat Erythrospermum 15; one of the resulting plants eared 15 days before the rest and its progeny all behaved as spring wheats, displaying pubescence of the coleoptiles and other characteristic properties of Lutescens 62, all of which characters were transmitted to the following seed generations. The hybrid was more vigorous than Lutescens 62, earlier and more resistant to Hessian fly and in ear characters it resembled the winter parent. Similar grafts of the winter wheat Lutescens 17 on to embryos of the rye Taraščanskaja IV gave rise to plants having more resemblance to wheat than to rye but bearing larger grains, the colour of which varied, some ears containing green, white and yellow grains. The embryo of the yellow grains was grafted on to the endosperm of Lutescens 17

and the resulting plants bore yellow vitreous grain like that of wheat, though in vegetative characters they retained the rye type.
Further reference is made to the dual graft of wheat on maize mentioned in *PBA*, XXIII, Abst. 1023.

2713 *Šuljga, P. M.* (*Vegetative-sexual hybridization in peas*). (*pp. 246–53*).
Grafting *Pisum sativum* on *Vicia faba* frequently resulted in increase of seed size in the pea scion. The seed progeny of some of the grafts in some cases bore inflorescences with 4–5 flowers, larger pods and larger seeds, some of which were pink or mauve in colour. By pollinating the V_0 and V_1 plants with pollen of *V. faba* 41 seeds have been obtained.

2714 *Maksimčuk, L. P.* (*Converting winter wheat to spring wheat*). (*pp. 253–73*).
The method described consisted in vernalizing moist seed of several winter varieties for 20–25 days; only partial earing was observed on spring sowing and the seed produced was sown again in late spring or somewhat earlier with partial vernalization. From two of the varieties so treated spring forms were produced, namely in Kanred-Fulcaster and Koveĭl (?Kawvale); all the characteristics of Kanred-Fulcaster, other than the winter habit, remained unchanged; various changes in morphological characters were observed in the converted Koveĭl, and a certain amount of segregation for the spring-winter habit and for time of earing was observed in the second and third generations. So far the spring forms selected from these changed populations have been inferior to the standard spring wheat, Lutescens 62, in yield, giving 17·8 c. per ha. as against 22·9 c. from the standard.

2715 *Maksimčuk, I. H.* (*Inheritance and variation in millet hybrids*). (*pp. 274–307*).
The F_1 hybrid between varieties Podol 24/273 x Veselyĭ Podol 367 was intermediate in most respects, the dark-green leaves and pigmented panicles of the latter variety being dominant. Similar behaviour was observed in other crosses, the results of which are tabulated; some of the hybrids matured up to 11 days later than the later of the two parents, whereas others were as early as or earlier than the earlier parent; in some cases differences in flowering time were observed between reciprocal crosses. Only in one cross was the panicle weight greater than that of the heavier parent. White grain proved dominant to yellow in several crosses.
Data are given on the characteristics of the F_2 families; transgression occurred in the direction both of earliness and lateness of panicle emergence, in some crosses by two and three weeks respectively. No segregation for grain colour occurred when both parents had white grain or both had pigmented grain; when one parent had coloured grain new shades often appeared in the F_2 and later generations. The average height of the F_2 plants was greater than that of the parents in most crosses but transgression occurred in respect of both tallness and shortness. Plants with coloured panicles were absent in all crosses between two unpigmented parents. In respect of panicle length the F_2 plants were mostly intermediate but transgression occurred occasionally. Plants with round grain usually occurred in the F_2, even in crosses between two varieties with oval grain.
Segregation occurred again in the F_3 and no family bred true until the F_5; some continued to segregate until the F_8 and later generations.

2716 *Maksimčuk, I. H.* (*Development of new forms and characters in millet on hybridization*). (*pp. 307–17*).
Forms with two grains per spikelet have appeared in a number of crosses and since the character is recessive it can be fixed by selection and be introduced into other forms by hybridization. Such forms have appeared particularly frequently in crosses with the smut-resistant form 1843 from the world collection. So far the two-grained forms produced have not yielded so well as the normal types but some of them are of possible interest on account of their smut resistance and high fodder yield.
Other segregates from crosses with line 1843 had branched spikelets.

2717 *Gavrilova, V. I.* (*Dependence of seed colour in peas on aging of the egg cell*). (*pp. 318–24*).
Unemasculated flowers of a green-seeded pea, Uladovka 208, when pollinated with a yellow-seeded variety, Mahndorf Viktoria, while the flowers were still in the bud gave 70–92·4% yellow seeds whereas pollination of fully opened flowers gave 98·5% green seeds. When emasculated flowers of the green-seeded variety 1227 were pollinated with yellow-seeded varieties at different times the best set was obtained from flowers that were just opening, pollen mixtures giving better sets than pollen from a single variety; pollination in the bud stage produced 90% yellow seeds and the proportion gradually diminished with time of pollination, being only 45·8% from fully opened flowers; considerably more yellow seeds were produced from pollen mixtures than from pollen from a single yellow

variety; young pollen from unopened anthers produced less yellow seeds than mature pollen.

2718 *Maksimčuk, I. H.* (*Inheritance and variability of immunity to smut in millet hybrids*). (*pp. 325–51*).

The popular variety Veselyĭ Podol 367 was crossed with line 1843 from the Leningrad collection, the latter variety being a form of *Panicum miliaceum* from the Primorskaja province and distinguished by resistance to *Ustilago panici-miliacei*. Under conditions in which hybrids from two susceptible parents showed infections of 60–100% and 1843 showed 0·16%, the F_4 of the cross, consisting of 848 families, contained 156 families (18·4%) with no infection, 65 (7·7%) with less than 50% infection and 620 (73·1%) with more. The families with low infection were subjected to selection for number of grains per panicle and size of grain; in the F_5 generation 78·5% of the families remained free from attack.

Similar results were obtained in observations of the F_2 generation of other crosses with 1843, except that more resistant hybrids occurred when this variety served as seed parent than when it served as pollen parent. In the F_3 generation 31·2–46·1% of the families remained free from infection. Families that bred true for morphological characters occurred from the F_5 generation onwards. No correlation was observed between resistance and any morphological features. By selection from the cross 367 x 1843, a resistant hybrid has been produced and named VNIS–29. It has retained its resistance over a number of years, from which it is concluded that no new races of the parasite have arisen.

2719 *Škodenko, V. I.* (*The question of increasing the resistance of millet to smut*). (*pp. 351–55*).

Attempts to produce a resistant variety by repeated selection of plants that remained free from infection in commercial varieties were not successful and the only way of producing good resistant varieties is thought to be by crossing with resistant parents such as K–1843.

2720 *Efimenko, T. M. & Škodenko, V. I.* (*Breeding spring wheat for resistance to brown rust*). (*pp. 355–65*).

Attempts to increase the resistance of Ukrainka and other standard varieties by selection were not successful. A certain number of resistant hybrids were obtained from crosses of Ukrainka with resistant parents and occasionally even in crosses with susceptible parents. Some of these were pollinated with resistant varieties and several promising resistant lines were selected from the hybrids. Others have been obtained by open pollination, using resistant wheats as the pollinating parents. In 1952 the average yield of these selections was 42·2 c. per ha. compared with 30·8 c. for the standard variety for the Poltava area, Lesostepka 75; some of the best selections exceeded Lesostepka 75 by 16·6 c. per ha., the best results of all being given by selection VP–499.

2721 *Ševčenko, V. N.* (*Change in virulence of bunt when it develops on different varieties of winter wheat*). (*pp. 365–69*).

The concept that bunt consists of different physiological forms is rejected, changes in infective capacity being ascribed to changes in the bunt population resulting from hybridization. Bunt collected from the resistant variety Lutescens 200 proved more virulent against Lutescens 200 but also more virulent against other, susceptible, varieties than material collected from the susceptible varieties themselves.

2722 *Šuljga, M. S.* (*A technique of hybridizing peas without emasculation*). (*pp. 383–88*).

Experiments are described in which flowers of Uladovka 208 with green seeds, when pollinated in the bud stage, without emasculation, by ripe pollen of yellow-seeded varieties, gave rise to 91·3–92·4% of yellow seeds. The percentage was only 1·5 when fully opened flowers were so pollinated.

2723 *Maljuta, D. I.* (*Crossing soft winter wheats with branched spring wheats pertaining to* Triticum turgidum). (*pp. 389–402*).

In crosses of *T. vulgare* x *T. turgidum* var. *plinianum* 'Kahetinskaja' the F_1 plants were mostly unbranched like the former parent, although several characteristics of *T. turgidum* were detectable in the mature ears, in some plants more than in others. The F_2 showed wide segregation for fertility and for most morphological characters, some ears being larger than those of the *T. vulgare* parent; 67·5% of the plants showed more resemblance to the maternal parent than to the pollen parent. The F_3 generation obtained by pollinating an unbranched F_2 segregate with the branched parent contained segregates belonging to *T. durum* as well as to *T. vulgare*, the latter being earlier in maturity than the former. The fertility of the branched segregates varied from 3·6 to 43% and only one of the branched *T. vulgare* segregates had more than 50 grains per ear. The F_4

and F_5 generations obtained from this F_3 comprised segregates belonging to *T. vulgare* and *T. durum* and some intermediate; the degree of branching diminished, no family in the F_5 having all branched ears. Three families each contained one rye-wheat hybrid and several families displayed greater resistance to brown rust than the *T. vulgare* parent. The fertility of the ears rose in each successive generation, reaching 100% in some F_5 plants.

2724 *Eljkina, E. A.* (*Biological rejuvenation of spring wheat seeds by winter sowing*). (*pp. 402–06*).

Crops of several spring wheats raised from seed sown in autumn gave higher yields and suffered less from yellow and brown rust, smut and other diseases than crops grown from spring sowing.

2725 *Samolevskiĭ, I. Ja.* (*Milling and baking quality of spring and winter wheats in the variety-testing system of the Sugar-beet Research Institute*). (*pp. 406–37*).

Data are given concerning 1000-grain weight, hectolitre weight, vitreousness, gluten content and extensibility, volume and height of loaf, and colour, porosity and flavour of dough for the variety Ukrainka and a number of the most popular varieties of winter and spring wheats produced by the institute, indications being given of their origin and general agronomic qualities. Some of the varieties with the highest yielding ability have inferior milling and baking qualities.

2726 (*Description of the promising varieties of cereals and grain legumes*). (*pp. 441–65*).

Brief descriptions are given of the promising varieties of winter wheat, spring wheat, oats, millet and peas produced by the Sugar-beet Research Institute and associated plant-breeding stations, with indications of their origin, main morphological and agronomic features, quality and disease resistance.

2727 Pruckova, M. G.
(New varieties of winter crops).
Vestn. seljskohozjaĭstv. Nauk. 1957 : No. 1 : 120–24. [Russian].

The winter-wheat varieties described include Skorospelka 3 [Early 3], a hybrid between Kanred-Fulcaster winter wheat and the spring wheat Klein 33, which has exceeded the standard Novoukrainka 84 in yield while ripening 6–7 days earlier; it is resistant to brown rust, bunt and lodging. Bezostaja 4 [Awnless 4] continues to be outstanding in strength of straw and baking quality. Belaja Cerkovj 198, from Erythrospermum 15 x Koveĭ (?Kawvale), is resistant to brown rust and Hessian fly and has large grains of good baking quality.
Other varieties described include early varieties of winter wheat resistant to yellow rust and lodging or drought, suitable for the Alma Ata region, Georgia and Azerbaijan, together with several improved forms of *Triticum durum*, Stende II rye suitable for Latvia and Falenki rye characterized by tolerance of cold wet conditions and having grain larger than Vjatka.
A drought-resistant alternative barley, Unumli-Arpa [Unumli barley], selected from a Moroccan barley, has proved free from lodging and shedding and survives well after autumn sowing; Odessa 17 is a winter-hardy barley produced by conversion from Pallidum 153 x Pallidum 28; it ripens before all other spring or winter barleys and has exceeded the spring barleys in yield.

Eerste Jaarboekje van de Stichting Nederlands Graan-Centrum 1956. (**First year book of the Netherlands Cereals Centre, 1956**) : Pp. 132.

2728 *Broekhuizen, S. Verslag over 1955.* (*Report for 1955*). (*pp. 4–16*).

The activities during 1955 of the Netherlands Cereals Centre, which is taking over the functions of Cocobro [Stichting voor Coördinatie van Culture en Onderzoek van Broodgraan (Institute for the Coordination of Cultivation and Research on Bread Cereals)] are reported briefly (cf. *PBA*, XXII, Abst. 235).

2729 *Veenenbos, J. A. J. Onderzoek naar het voorkomen van roest,* Puccinia *spp., bij granen in 1955.* (*Investigation on the occurrence of rust,* Puccinia *spp., on cereals in 1955*). (*pp. 32–37*).

Tabulated data are presented on the incidence of *P. glumarum, P. graminis, P. triticina, P. secalina, P. simplex* and *P. coronifera* in the Netherlands in 1955. A new physiological race of *P. glumarum*, to which the variety Heine VII proved highly susceptible, was isolated.

2730 *Dantuma, G. Kan wintergerst een gewas voor de zandgronden worden?* (*Can winter barley become a crop for sandy soils?*) (*pp. 38–42*).

Varietal differences in the resistance of a number of Dutch and German winter-barley varieties to low temperatures and low soil pH are noted. All the varieties tested proved unsuitable in these respects for widespread cultivation on sandy soils in Friesland and other northern districts of the Netherlands and efforts are now being made at the Wageningen Plant Breeding Institute to develop varieties with improved

winter hardiness and tolerance of acidic soils and consequently suitable for cultivation in these areas.

2731 *Meppelink, E. K. De bakkwaliteit van de in Nederland verbouwde tarwerassen. Oogst 1954.* (*The baking quality of wheat varieties grown in the Netherlands. 1954 harvest*). (*pp. 58–65*).

Data on the baking quality of the winter wheats Heine VII, Leda, Werla and Carsten VI and the spring wheats Peko and Carpo (= Strube 4090) are presented.

2732 *Meppelink, E. K. De bakkwaliteit van de in Nederland verbouwde tarwerassen. Oogst 1955.* (*The baking quality of wheat varieties grown in the Netherlands. 1955 harvest*). (*pp. 66–83*).

Data on the baking quality of 7 winter and 4 spring varieties are presented.

2733 *Het onderzoek op graangebied in 1956.* (*Research on cereals in 1956*). (*pp. 84–115*).

An account is given of the work of the Netherlands Grain Centre. A wide range of crosses are being carried out with a view to improving the baking quality of wheat varieties and also resistance to diseases, drought, low temperatures and sprouting in the ear.

2734 Unrau, J.
Development, licensing, distribution and zonation recommendations of new varieties of grain.
Pr. Bull. Alberta Univ. Ext. Dep. 1957 : **42** : 5–6.

This popular article outlines briefly the work involved in the breeding, testing and licensing of new cereal varieties.

2735 McCulloch, R. N.
Roseworthy Agricultural College. Notes from the Annual Report 1955-56.
J. Dep. Agric. S. Aust. 1957 : **60** : 267–72.

This report of investigations at the above college in South Australia includes a summary of the results of trials of new hybrid selections of cereals. The following showed most promise: the wheats RAC 302 (Javelin 48 x Insignia), RAC 225 from a cross of Gabo x (Cadia x Sword) with (Dundee x Kenya x C6042) x Javelin 48, RAC 200 (Claymore x Bencubbin) and RAC 23 (Gabo x Florence x Dundee); and the oat 049–1–2 [Orient x (Mulga x Belar)].

2736 Fedorov, A. K.
(The biology of development of alternative plants and their experimental production).
Ž. obšč. Biol. (J. gen. Biol), Moskva 1956 : **17** : 462–72. [Russian].

Successive sowings were made of a number of varieties of cereals classed as winter, semi-winter, alternative and spring forms. When sown at the end of the summer the alternative forms such as Noé wheat and Odessa 17 barley showed less development of the ear primordia than the spring forms and on sowing in autumn no development at all took place; the delay was shown to be caused by photoperiodic and temperature factors; the dry-matter content of the alternative and winter forms under such conditions was higher than that of the spring forms.

By sowing the spring barley Pallidum 45 and the spring wheats Milturum 0321 and Moskovka in autumn a number of alternative and winter forms were obtained and some alternative forms were also found among the progeny of winter rye subjected for a number of generations to spring sowing.

2737 Müller, H. W.
Grössere Ertragssicherheit durch den Anbau auswuchsfester Getreidesorten. **(Greater security of yield by the cultivation of cereal varieties that are resistant to sprouting in the ear).**
Dtsch. Landw., Berl. 1957 : **8** : 76–80.

Varietal differences in susceptibility to sprouting in the ear are noted for the varieties of wheat, oats, rye and barley approved for cultivation in East Germany. At the Bernburg Plant Breeding Institute, line selection in the winter barley Kleinwanzleben and the oat variety Petkus has resulted in improved resistance to sprouting.

2738 Oltmann, W.
Vereinfachung der Kreuzungstechnik durch Schnittkastrationen bei selbstbestäubenden Getreidearten. **(Simplification of crossing technique by emasculation by cutting in self-pollinating cereal species).**
Züchter 1956 : **26** : 315–19.

The method described consists of removing approximately two thirds of the outer and inner glumes by means of two oblique cuts or a single transverse cut. The tips of the anthers are severed in this process and the anthers later shrivel up; the stigmas are undamaged. In the case of wheat and barley, it was found possible to achieve a high percentage of cross pollination

by this means when the plants to be emasculated were sown in the proximity of the pollen parents. The method described was not successful with oats.

2739 Endo, T.
(Flavone pigments in *Triticum* and related species).
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 109–14. [Japanese].

This paper is the full version of that summarized in Abst. 1257.

2740 Simon, U.
Untersuchungen zur Systematik und Physiologie des Weihenstephaner Getreidesortimentes unter besonderer Berücksichtigung des Weizens und der Sommergerste. (**Studies on the systematics and physiology of the Weihenstephan cereal collection with special reference to wheat and spring barley**).
Z. Acker- u. PflBau. 1957 : **102** : 443–60.

A key is given for the identification of botanical and cultivated varieties of wheat, spring barley and oats in the collection maintained at Weihenstephan, Bavaria, and the geographical distributions of the varieties are described. In the case of wheat, several new morphological characteristics, including ear density, were employed for the purposes of classification. Associations were established between lodging resistance on the one hand and ear density, stalk length and ear weight on the other. In barley, observations were made on the date of ear emergence, flowering and ripening; varieties that matured at the same time often differed considerably from each other in their phasic development. Varietal differences in the resistance of barleys to lodging, *Erysiphe graminis* and *Puccinia simplex* are noted. Early-maturing forms from the Caucasus proved highly resistant to *P. simplex* but were extremely susceptible to *E. graminis*; in the case of late-maturing varieties from Portugal this relationship was reversed.

2741 Skvorcov, S. N.
(The methods of producing and judging élite seed of grain crops).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 5 : 20–33. [Russian].

Data are given showing that at some seed-production stations the élite seed exceeded that of other reproductions by more than 6 c. per ha. in yield while in other stations its yield was very little higher, or not infrequently even lower. The differences were also less for some varieties than for others, Lutescens 62 spring wheat for instance rarely showing a difference of more than 1 c., and the same élite seed sometimes gave an increase when grown in one zone and not in another. Suggestions for remedying this situation are presented.

2742 Listowski, A., Czarnowski, J., Kaczorkówna, S. & Sawicka, G.
Wrażliwość na suszę glebową odmian pszenicy jarej, jęczmienia jarego i owsa uprawianych w Polsce. (**The sensitivity of varieties of spring wheat, spring barley and oats cultivated in Poland to soil drought**).
Roczn. Nauk rol. Ser. A : 1956 : **72** : 373–421.

Details are given of the reactions of eleven wheats, seven barleys and eight oat varieties to (*a*) chronic drought and (*b*) a two-week period of drought before heading. Intervarietal differences in sensitivity were observed.

2743 Vallega, J., Cenóz, H. P., Tessi, J. L., Frecha, J. H. & Rodriguez Amieva, P. J.
Importancia de las enfermedades de los cereales en 1954 y comportamiento de variedades cultivadas de trigo, avena y cebada. (**The importance of cereal diseases in 1954 and the behaviour of cultivated varieties of wheat, oats and barley**).
Bol. inform. Inst. Fitotec., Castelar 1955 : No. 3 : Pp. 5. (Mimeographed).

Notes and tables are presented showing the reaction, in the cereal-growing region of Argentina, of commercial varieties and new selections of wheat to *Puccinia triticina*, *P. graminis*, *Septoria tritici* and *Erysiphe graminis*, of old and new barley varieties to *P. anomala*, *Rhyncosporium secalis*, *Helminthosporium teres* and *E. graminis* and of oat varieties and selections to *P. coronata* and *P. graminis*. The physiological rust races observed are recorded.

2744 Hiratsuka, N. & Hiratsuka, H.
(Studies on the rust resistance of cereals. VI. Studies on the susceptibility of *Avena*, *Triticum* and related plants to crown rust).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 147–55. [Japanese].

The reactions of numerous species and varieties of *Avena*, *Elymus*, *Hordeum*, *Triticum*, *Aegilops*, *Lolium*, *Bromus* and *Holcus* and some intergeneric hybrids to infection by *Puccinia coronata* var. *avenae* '231' were investigated. The most resistant forms of cultivated oat were Shokan 1

[Victory over Rust 1] and various introduced, mainly American, varieties.

2745 Hermansen, J. E.
Outbreak of *Puccinia graminis* in Denmark in 1951 and the reactions of some Danish cereal varieties to certain physiologic races.
Phytopathology 1957 : **47** : p. 15. (Abst.)

Details are given of the reaction shown by Danish varieties of wheat, barley, oats and rye to races of *Puccinia graminis*, in tests carried out in Minnesota.

2746 Gibler, J. W.
"Enanismo," a virus disease of cereals in southern Colombia.
Phytopathology 1957 : **47** : p. 13. (Abst.)

Symptoms varying from rosetting, with failure of spike development, to slight stunting have been observed on cereals in southern Colombia and northern Ecuador. The causal agent is thought to be an unidentified virus to which the local barley varieties DC 7N, DC 2N, FR1391 and FR1714 are nearly immune and many Colombian wheat hybrids, as well as Ciento Cincuenta [150] and Thatcher are tolerant.

WHEAT

2747 Matsumura, S. & Fujii, T.
Effect of X-rays on fertility and mutation rate in Einkorn wheat.
Wheat Inform. Serv. Kyoto 1956 : No. 4 : p. 4.

Higher frequencies of chromosome aberrations and gene mutations and increased sterility were found at the National Institute of Genetics, Mishima, Japan, in *Triticum monococcum* with increased X-ray dosage and with decreased wave length. In all cases the effects were more marked in *T. monococcum* var. *vulgare* than in *T. monococcum* var. *flavescens*.

2748 Swaminathan, M. S. & Natarajan, A. T.
Effects of fast neutron radiation on Einkorn, Emmer and bread wheats.
Wheat Inform. Serv. Kyoto 1956 : No. 4 : 5–7.

After fast neutron irradiation of *Triticum dicoccum* 'Khapli,' *T. aestivum* 'C591' and *T. monococcum* 'Japanese Early,' the greatest decrease in plant vigour and survival was found in *T. monococcum* and the least in *T. dicoccum*. The average number of chromosome breaks per cell was found to be considerably higher in *T. aestivum* than in the other two species and up to 40% of the cells were found to have all their chromosomes fragmented in this species. In this case the frequency of occurrence of breaks was not found to follow a Poisson distribution, although it did so in the other two species.
Analysis of the types and position of chromosome breakage in *T. monococcum* indicates that the region near the supernumerary constriction of the Sat–II chromosomes is preferentially disposed to breakage by fast neutron radiation, but no evidence of a similar effect was found in material treated with X-rays or P^{32}. It is probable that breakage occurs only in one chromosome of the Sat–II pair and not at random in either of them.

2749 Toma, Á.
Búzanemesítésünk útja. (**The course of our wheat breeding**).
Agrártudomány 1955 : **7** : 557–62.

In this popular article past, present and future trends of Hungarian wheat breeding are discussed and short descriptions are given of the main home-bred wheat varieties.

2750 Varietà di grano in coltivazione—in diffusione—in prova 1956. (**Varieties of wheat in cultivation, being released and in test in 1956**).
Terra e Sole 1956 : No. 170 : unpaginated.

In addition to varieties already widely cultivated, such as Funo, Fortunato and Fiorello (cf. *PBA*, XIX, Abst. 628), some promising new wheats just released are described and illustrated. They are: Funone, exceptionally cold resistant and equal to Funo in resistance to lodging and rust; Funotto, an early variety very resistant to cold and rusts and stronger in the straw than Funo; and Falchetto, an early variety that has given exceptionally high yield in southern and central Italy where the crops are not subject to lodging and where it may prove a substitute for Falcone.
A number of other new varieties that are still under observation are also described; all are resistant to lodging, cold or rusts and one of them, 1.Bo.2166, has branched ears.

2751 Téllez Molina, R. & García Pozuelo, E.
Ensayos comparativos de rendimiento de trigos híbridos (1954–55). [**Comparative yield tests with hybrid wheats (1954-55)**].
An. Inst. nac. Invest. agron., Madr. 1956 : **5** : 323–97.

In the year under review (cf. *PBA*, XXVI, Abst. 3150) the dry spring made it possible to eliminate a number of lines deficient in drought resistance. The superiority of Aradi and

Canaleja has been confirmed among the bread wheats and of Orgaz in *Triticum durum*. Floreal has given promising results in certain areas.

2752 GADEA, M.
Séptimo año de experiencias con nuevas variedades de trigo (1954–55). [**Seventh year of experiments with new varieties of wheat (1954-55)**].
An. Inst. nac. Invest. agron., Madr. 1956 : **5** : 399–438.

In the year under review (cf. *PBA*, XXVI, Abst. 3940), the new variety Dimas proved promising in certain regions, Magdalena and Ariana in others.

2753 MARJANEN, H.
Kevätvehnälajikkeiden satoisuus paikalliskokeissa. Koetuloksia vuosilta 1938–39 ja 1941–54. (**The productivity of spring wheat varieties in local experiments. Results of trials in the years 1938-39 and 1941-54**).
Valt. Maatalousk. Julk. 1955 : No. 145 : Pp. 89.

Local variety trials conducted throughout Finland are described. Tammi or Timantti [Diamond] were used as standards. On the average, Timantti is exceeded in productivity only by Apu [Aid] and Kärni [Kernel].
Comparative data for earliness show Apu to be the earliest variety of those tested; Tammi had the strongest straw.

2754 KUČUMOV, P. V.
(The hybridization method in breeding work).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 4 : 17–21. [Russian].

This article, dealing mainly with Mičurinist breeding techniques and recent Soviet research along these lines, mentions a new spring wheat Hordeiforme 46 which was obtained by complex hybridization at Harjkov. For a number of years it has persistently outyielded the standard for Harjkov.

2755 UHANOVA, O. I.
(New winter-wheat varieties in Transcaucasia).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 4 : 56–57. [Russian].

Descriptions are given of Vargisi, selected from Nebred in Georgia, and Azerbaijan 1, Azerbaijan 2 and Ag-Bugda [White wheat] 13, bred at the Azerbaijan Breeding Station. All these are distinguished by high yield, large grain, good baking properties and resistance to lodging and diseases. Vargisi outyields the Georgian standard Dolis-Puri 35–4 and the other new wheats outyield Arandany, the standard in Azerbaijan. Ag-Bugda is a good macaroni wheat.

2756 PRIADCENCU, A. *ET AL.*
Les meilleures variétés de blé de printemps pour la République Populaire Roumaine. (**The best varieties of spring wheat for the Rumanian People's Republic**).
Rev. Biol., București 1956 : **1** : 141–202.

The Rumanian version of this article was summarized in *PBA*, XXVI, Abst. 2167.

2757 RATTRAY, A. G. H.
Agricultural Experiment Station, Salisbury. Annual report of experiments: season 1955-56.
Rhod. agric. J. 1957 : **54** : 56–81.

Wheat. Crosses were made to obtain selections resistant to stem rust and lodging.
Maize. Back crossing was initiated to introduce resistance to *Helminthosporium turcicum* into the inbred A5–7–6. Progress was made in producing male-sterile counterparts of promising lines such as N3–1–4–9 and N3–2–3–3. Lines were tested for specific combining ability with the single hybrid N3–1–4–9 x A5–7–6, with encouraging results from the point of view of developing productive double hybrids.
Sunn hemp. Interspecific hybridization was attempted in order to develop a vigorous type resistant to stem diseases.

2758 Resultados de los ensayos comparativos de rendimiento "standard" entre variedades de trigo. (**Results of comparative trials of standard yield of wheat varieties**).
Bol. Prod. Fom. agríc., B. Aires 1955 : **7** : No. 55–60 : 21–69.

Tables are presented showing yield, susceptibility to rusts, smut, cold, lodging, shattering and drought and length of growth period of wheat varieties tested during 1950–55 in five regions of the wheat-growing area of Argentina. In order to ascertain the most favourable sowing time for each variety, five different sowing times were used in each test.

2759 PAL, B. P., SIKKA, S. M. & RAO, M. V.
Inheritance studies in wheat.
Indian J. Genet. 1956 : **16** : 32–46.

The inheritance of resistance to *Puccinia graminis* var. *tritici*, *P. triticina* and *P. glumarum* and of awn length and glume pubescence have been studied at the Indian Agricultural Research Institute, New Delhi, in F_2 and F_3 progeny of

NP789 x Frondosa and Ridley x PbC518. In the first cross, reaction to *P. graminis* var. *tritici* was found to be controlled by three complementary gene pairs, reaction to *P. triticina* by two complementary gene pairs and to *P. glumarum* by one independent and two complementary gene pairs. Two duplicate factors were found to control awn length, possibly influenced by other, minor, genes and glume colour was controlled by a single gene pair, with brown dominant to white. In the second cross both awn character and glume pubescence were controlled by a single gene pair.

2760 Smith, G. S.
Inheritance of head characters in tetraploid wheat hybrids: I. Glume tenacity and head type in Mindum durum x Vernal emmer.
Agron. J. 1957 : **49** : 138–41.

The high glume tenacity of Emmer wheat has been found to be dominant over the low glume tenacity of the *durum* parent in the above cross. A number of major and minor factors appear to be involved since several F_3 progenies were recovered which were relatively homozygous for intermediate degrees of glume tenacity. In the F_3 a number of plants with clavate heads were produced, many by F_2 plants which had not shown this character and a two-factor hypothesis is suggested to explain these results. The gene *Cl* is thought to determine the appearance of clavate heads in the absence of an epistatic, inhibiting gene *I*. Vernal is thought to possess the genotype *IIClCl*, Mindum *iiclcl*, progeny with clavate heads being *iiClCl* or *iiClcl*. The *I* gene appears either to be one of the major factors for glume tenacity or to be closely associated with such a gene, many non-clavate plants having significantly tougher glumes than clavate plants.

2761 Hermsen, J. G. T.
Semi-lethaliteit in kruisingsnakomelingschappen van tarwe. **(Semilethality in the progenies of wheat crosses).**
Genen en Phaenen 1957 : **2** : No. 1 : p. 12.

The crosses Koga x H11, Koga x Heine's 476, Koga x Heine's VII, Koga x Mendel, Eskişehir x Heine's VII and their reciprocals and Eskişehir x *Triticum spelta* gave rise to F_1 progenies with varying degrees of semilethality. The semilethal plants grew normally in the juvenile stage but, from the earing stage onwards, dried up and died after producing a few grains that ripened considerably before those of the parent varieties. The F_2 segregated in the ratio 9 semilethal : 7 normal. Semilethality is attributed to the interaction of modifying genes from the parent varieties.

2762 Watanabe, Y.
(On crossability between ordinary wheats and *Triticum timopheevi*).
Tohoku Nogyo Shikenjo Kenkyu Hokoku/Rep. Tohoku agric. Exp. Sta. 1955 : No. 4 : 87–91. [Japanese].

Figures are given for percentage seed set and germinability of the hybrid seed of interspecific hybrids between *T. vulgare* (27 varieties), *T. compactum*, *T. spelta*, *T. sphaerococcum* and *T. macha*, on the one hand, and *T. timopheevi*, as pollinator, on the other.

2763 Borojević, S.
The occurrence of new color of glumes and awns in the *Triticum vulgare* and *Triticum dicoccum* cross.
Wheat Inform. Serv. Kyoto 1956 : No. 4 : p. 2.

Plants with red glumes were found at the Institute of Plant Breeding and Genetics, Zagreb, Yugoslavia, among the F_1 progeny of the cross *T. vulgare* var. *lutescens* 'Graf Törring' x *T. dicoccum* var. *farrum*, both of which have white glumes. Segregation in the F_2 and later generations indicated that awn and glume colour is controlled by at least two pairs of factors, segregating for red and white in the ratio 9 : 7. More intensive awn and glume colour, ranging from dark red to black, occurred in the F_4 and later generations in hot dry seasons but in many cases the black colour disappeared in the F_5 and succeeding generations. It is suggested that this may be connected with environmental factors, since bagging of the ears before heading to exclude sunlight prevented the development of awn and glume colour. Black awns were only found in plants with 14 chromosomes and it is concluded that the D genome inhibits the development of the black colour.

2764 Kump, M.
Anomalije klasa kod species bastarda *Triticum vulgare* x *Triticum dicoccum*. **(An ear anomaly in an interspecific hybrid of *T. vulgare* x *T. dicoccum*).**
Poljopr. Znanst. Smot. 1953 : **15** : 27–37.

The F_1 plants resembled the *T. vulgare* parent but were characterized by a branched rachis, an irregular arrangement of the spikelets on the rachis, and by nodes without spikelets or with more than two spikelets on a node. A few ears had the spikelets arranged in the normal way but the upper spikelets were attached to the

rachis as in *T. spelta*. The flowers, pistils and anthers were well developed but the anthers did not dehisce. Microsporogenesis was irregular and the pollen grains were small, empty, starchless and mostly sterile.

2765 SÁNCHEZ-MONGE, E.
Wheat rust in Zaragoza, Spain.
Robigo, Castelar 1956 : No. 2 : p. 14; also in Spanish, p. 14. (Mimeographed).

The varieties Rumanian 3659 and Magyaróvár 3355 and varieties of *Triticum timopheevi* have been used at Zaragoza, Spain, in breeding for resistance to *Puccinia glumarum*. Promising lines resistant to *P. glumarum* have already been obtained from crosses of (*T. aestivum* x *T. timopheevi*) x *T. aestivum*.

2766 KIHARA, H. & YAMASHITA, K.
Wheat and its relatives.
Wheat Inform. Serv. Kyoto 1956 : No. 4 : 16–24.

The authors review work carried out in the following fields: genome analysis of pentaploid hybrids of *Triticum*, genome relationships of different species of *Aegilops*, autopolyploids and amphidiploids of *Triticum* and *Aegilops*, the synthesis and possible origin of hexaploid wheats, X-ray induced mutations in Einkorn wheats, right and left handedness in *Triticum* and *Aegilops*, Japanese varieties of wheat, nuclear substitution in *Triticum* and *Aegilops*, wheat-rye hybrids and genome analysis in *Agropyron*. Most of this work has already been summarized in *Plant Breeding Abstracts* from other sources.

2767 WATANABE, Y., MUKADE, K. & SAITO, S.
(Studies on the production of amphidiploids as a source of resistance to leaf rust in wheat. III. Cytogenetical studies on the F_1 and amphidiploid of *Triticum Timopheevi* Zhuk. x *Aegilops longissima* Schw. et Musch.)
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 76–84. [Japanese].

The F_1 of the above cross had the modal meiotic configuration $2_{II} + 17_I$. In the colchicine-induced amphidiploid, up to 21 bivalents were formed. The amphidiploid is immune from many races of *Puccinia triticina* and crosses quite readily with *Triticum vulgare*, *T. timopheevi*, *T. spelta*, *T. compactum*, *T. macha* and rye.

2768 SEARS, E. R.
The B genome of *Triticum*.
Wheat Inform. Serv. Kyoto 1956 : No. 4 : 8–10.

Details are given of the average numbers of univalents, bivalents, trivalents, quadrivalents, 5-valents and 7-valents in hybrids involving *Aegilops bicornis* (S^b), *Ae. speltoides* var. *ligustica* (S^s), *T. monococcum* (A^m) and *T. dicoccoides* (AB), the genomes of the hybrids being A^mS^b, $A^mA^mS^bS^b$, AA^mBS^b, A^mS^s, $A^mA^mS^sS^s$, ABS^s and AA^mBS^s. The figures given indicate that S^b has a greater pairing affinity with B than with A, while the reverse is true for S^s. The possible origin of the B genome is discussed (cf. Abst. 370).

2769 TABUSHI, J.
Fertility of F_1 hybrids between *Triticum persicum* and *Aegilops squarrosa* No. 1.
Wheat Inform. Serv. Kyoto 1956 : No. 4 : 11–12.

Less satisfactory plant growth and pollen fertility were found in F_1 progeny of *T. persicum* var. *stramineum* x *Ae. squarrosa* '1' than when *Ae. squarrosa* '2' was used as the pollen parent. The frequency of chromosome pairing at metaphase I decreased with increasing age of the plants.

2770 ATKINS, I. M.
New source of resistance to rust.
Robigo, Castelar 1956 : No. 2 : p. 13; also in Spanish, p. 14. (Mimeographed).

"Current rust research work in Texas is designed to bring together a wide base of germ plasm from world and species sources in order to avoid past errors in breeding resistant varieties. A new source of resistance from (*Triticum dicoccoides* x *Aegilops speltoides*, amp.) x Austin^2 appears especially promising."
[Author's summary].

2771 NAKAJIMA, G.
Cytogenetical studies on the intergeneric F_1 hybrids between *Triticum vulgare* and three species of *Secale*.
Jap. J. Bot. 1954 : **14** : 194–214.

The morphology and cytology of F_1 hybrids between *T. vulgare*, on the one hand, and *S. vavilovii*, *S. africanum* and *S. montanum*, on the other, are described. The hybrids bore a closer resemblance to the wheat parent than to rye. The modal bivalent frequencies were 0_{II}, 0_{II} and 2_{II}, respectively. Longitudinal splitting of univalents during meiosis was observed in all cases.

2772 NAKAJIMA, G.
Cytogenetical studies on the intergeneric F_1 hybrids between *Triticum timopheevi* and 3 species of *Secale*.
Jap. J. Bot. 1955 : **15** : 1–9.

Descriptions are given of the morphology and

meiotic behaviour of F_1 intergeneric hybrids between *T. timopheevi* and *S. cereale*, *S. africanum* and *S. montanum*. The hybrids bore a closer resemblance to *T. timopheevi* than to rye. Meiosis could not be studied in the hybrids of *S. cereale* and *S. montanum* owing to anther abortion. In the hybrid of *S. africanum*, the modal bivalent frequency was 0_{II}.

2773 NAKAJIMA, G.
(Cytogenetical studies on F_1 hybrids between *Triticum Spelta*, on the one hand, and *Secale Vavilovii* and *S. africanum* on the other).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 101–06. [Japanese].

The morphology and cytology of the above hybrids are described. The modal number of bivalents was 2_{II} in the cross with *S. vavilovii* and 0_{II} in the cross involving *S. africanum*.

2774 NAKAJIMA, G.
(Cytogenetical studies on the F_1 hybrids between *Triticum sphaerococcum* on the one hand and 3 species of *Secale* on the other).
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 217–23. [Japanese].

The rye species used were *S. vavilovii*, *S. africanum* and *S. montanum*. The hybrids more nearly resembled the wheat parent; all had 28 somatic chromosomes. Meiosis in the hybrids is described, the modal bivalent frequency being 0_{II} in each case.

2775 RILEY, R.
Adding individual rye chromosomes to wheat.
Wheat Inform. Serv. Kyoto 1956 : No. 4 : 12–13.

Six of the seven possible disomic additions of the chromosomes of *Secale cereale* 'King II' to *Triticum vulgare* 'Holdfast' have been obtained. In each case the chromosome added may be recognized by its phenotypic effect and in some cases also by its morphology.

The only distinguishing character transferred from rye to wheat is "hairy neck" but some of the addition lines show complementary effects resulting in expressions not shown by either rye or wheat. The most important of these is the resistance to both rye and wheat races of mildew developed by two of the addition lines. The resistance to wheat mildew introduced by chromosome II is controlled by a factor on the nonsatellited arm.

Irregularity of meiotic pairing varies between the different addition lines and is thought to be due to lack of balance between the chromosomes of the donor and receptor species. Further crosses are being made in the hope of producing disomic addition lines in which some factors of the alien pair are heterozygous, while those of the wheat chromosomes are homozygous, so that selection can be carried out.

2776 MATSUMURA, S. & MURAMATSU, M.
F_1 hybrids between three species of *Triticum* and *Agropyron intermedium*.
Wheat Inform. Serv. Kyoto 1956 : No. 4 : 13–14.

Hybrids of *T. polonicum* var. *vestitum*, *T. durum* var. *reichenbachii* and *T. vulgare* var. *erythrospermum* with *A. intermedium* are described. The respective chromosome numbers of the hybrids were $2n = 35$, 35 and 42 and the average chromosome configurations at metaphase I were: $0{\cdot}03_{IV} + 0{\cdot}2_{III} + 6{\cdot}8_{II} + 20{\cdot}8_{I}$ with $(1–2)_{II}$ ring shaped; $0{\cdot}04_{IV} + 0{\cdot}3_{III} + 7{\cdot}7_{II} + 19{\cdot}5_{I}$ with $(3–4)_{II}$ ring shaped; and $0{\cdot}03_{IV} + 0{\cdot}6_{III} + 10{\cdot}1_{II} + 19{\cdot}8_{I}$ with $(2–3)_{II}$ ring shaped. The occurrence of 7–10 bivalents in the F_1 hybrids is taken to indicate homologies among the genomes of *A. intermedium* and the possibility of autosyndesis of a few chromosomes among the genomes of *Triticum* or allosyndesis between *Triticum* and *Agropyron*.

2777 PISAREV, V. E.
(Inheritance in *Triticum-Agropyron* hybrid 1).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1956 : No. 24 : 70–71. [Russian].

Germinating seed exposed to 0° C. for 14 days and −5 to −6° C. for almost 3 months and sown in June gave rise to plants which segregated for a number of characters; some of them resembled the first-generation hybrids in ear type and two of them formed fresh shoots after the first ears had matured and been removed.

2778 NAKAJIMA, G.
[Genetical and cytological studies on the breeding of amphidiploid types of wheat-rye. III. A. The maturation division of the pollen mother cells of 42-chromosome F_2 plants raised from *Triticum turgidum* ($n = 14$) x *Secale cereale* ($n = 7$)].
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1952 : **65** : 288–94. [Japanese].

The bivalent frequencies of F_2 42-chromosome

segregates ranged from 7_{II} to 21_{II}. Occasional quadrivalents were also noted. Chromosome separation at anaphase was mostly regular. Abnormal plates with $39_{II} + 6_I$ and $7_{II} + 14_I$ were observed too. (Cf. *PBA*, XXIV, Abst. 207).

2779 NAKAJIMA, G.
[Genetical and cytological studies on the breeding of amphidiploid types between wheat and rye. III. B. Maturation division in the pollen mother cells of F_2 plants of *Triticum turgidum* ($n = 14$) x *Secale cereale* ($n = 7$) having $2n = 41$ or 43 chromosomes].
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1953 : **66** : 112–18. [Japanese].

In continuation of the studies reported in *PBA*, XX, Abst. 2231 and XXIII, Abst. 2568, meiosis was studied in F_2 plants with 41 or 43 chromosomes. The modal bivalent number in the 41-chromosome plants was $18–20_{II}$; the genome constitution is inferred to be AB + R −1. The frequency curve of bivalents in the 43-chromosome plant was bimodal with modes at 10_{II} and 17_{II}; its genome constitution is uncertain.

2780 HLYSTOVA, A. F.
(Predominant influence of the maternal organism upon the formation of heritable characters of hybrids in plants).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1956 : No. 23 : 89–99. [Russian].

The F_1 and F_2 of some wheat hybrids and tomato hybrids obtained by direct and reciprocal crossing at Gorki Leninskie have been analysed and the results form the basis of a discussion of the problem of matrocliny. It was found that in the case of wheat the progeny tended to resemble the ♀ parent with regard to such characteristics as spring or winter habit, awns, grain colour, tillering and average grain yield per plant. In tomato progenies maternal influence was observed with regard to most characteristics, especially the shape of fruit and the number of locules. The differences between the hybrids from direct and reciprocal crossing involving cultivated varieties and distant forms such as Smorodinovidnyi [Currant] and Zolotaja Koroleva [Golden Queen] were the most apparent.

2781 PUGSLEY, A. T.
"White scald" mutation in wheat.
Wheat Inform. Serv. Kyoto 1956 : No. 4 : p. 7.

A recessive mutation, termed white scald, was found at the Agricultural Research Institute, Wagga Wagga, NSW, Australia, among F_2 progeny of the cross Magyaróvár 98 x Thew. Transverse, white scald-like bands appear on one or more of the first formed leaves but later leaves are usually unaffected and the plants grow normally and produce seed.

2782 KUMP, M.
Vulgaroidna mutacija klasa kod species bastarda *Triticum vulgare* x *Triticum dicoccum**. **(Vulgaroid mutation in an interspecific hybrid of *T. vulgare* x *T. dicoccum**).**
Poljopr. Znanst. Smot. 1953 : **15** : 39–49.

Among the F_1 of the cross *T. dicoccum* x *T. monococcum* was a plant which bore an ear of the *T. vulgare* type; the other ears of the same plant were intermediate between *T. dicoccum* and *T. monococcum* and were characterized by complete sterility and a brittle rachis. The vulgaroid form was also sterile. It had a tough rachis, with spikelets bearing, on the average, six florets and awns on the inner flowering glumes of the first, second and third florets. It is thought that this form arose either (1) by chromosome mutation in genomes A or B or (2) as a result of the altered ratio of chromosomes in the A and B genomes. It is stated that the development of vulgaroid ears is not connected with genome C. It is concluded that *T. vulgare* may arise from other *Triticum* spp. without hybridization with such genera as *Agropyron* or *Aegilops*.

2783 KIMBER, D. S.
"Atomic" seeds.
Agric. Merch. 1957 : **37** : No. 3 : 64–66.

This short popular survey of the possibilities of inducing economically useful mutants mentions experiments initiated in 1953 at the Twyford Mill Plant Breeding Department, Banbury, Oxfordshire, England, to investigate the mutagenic effects of radiation upon wheat. Hybrid 46 and Holdfast were exposed to neutron, γ and X radiation, a wide range of variants being obtained in the progenies of the treated plants. Most of the mutants were of no practical value. Some short-strawed types were secured but they

* The text and English title of this article show that the hybrid *T. dicoccum* x *T. monococcum* is intended.

usually had small, stunted ears; they may however be useful as parents imparting the property of short straw to standard varieties.

2784 Angelini, F.
L'energia nucleare al servizio della genetica agraria. (**Nuclear energy in the service of agricultural genetics**).
G. Agric. 1956 : **66** : 473–74.

Two cultivars, Tevere and F51, subjected to irradiations of 20,000 r. of γ rays, gave rise to a number of plants with shorter, thicker straw and greater tillering capacity than the parents; in Tevere the mutants had longer, laxer ears and in F51 shorter, more club-like ears with a larger number of grains.

2785 Lebedev, D. V.
(**New data of H. Stubbe on the "conversion" of winter wheats into spring wheats**).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 897–99. [Russian].

The author refers to the claims of Soviet botanists to have converted spring into winter cereals and *vice versa* and to critical examinations of these claims made by Skripčinskiĭ (cf. *PBA*, XXV, Abst. 2899) and Stubbe (cf. *PBA*, XXVI, Abst. 1146), the conclusion being reached that the supposed conversions were the result of faulty technique and heterogeneous material.

2786 Tušnjakova, M. M.
(**Red-grained and red-eared forms of some wheat varieties**).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1956 : No. 23 : 145–50. [Russian].

The occurrence in northern districts of the USSR of red-grained and red-eared forms in varieties with white grains and ears is attributed to conversion. The forms with the red grain and ears are regarded as better adapted to the northern climatic conditions, as evidenced by the predominantly red-grained and red-eared varieties that are being grown in northern countries. Among the reported instances of conversion, mention is made of a spring wheat of var. *graecum* that had been trained for the winter habit at Gorki Leninskie and changed into a winter wheat pertaining to var. *erythrospermum*.

2787 Pisarev, V. E. & Žilkina, M. D.
(**Moskovka Krasnozernaja**).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 4 : 22–26. [Russian].

Moskovka Krasnozernaja [Red-grained Moscow] was obtained by selection from plants of the spring wheat Moscow, whose hereditary nature had been shattered by autumn sowing at Nemčinovka. The new form is characterized by a longer postharvest maturation period than the initial variety and has higher protein and gluten contents.

2788 Singh, H. B., Anderson, E. & Pal, B. P.
Studies in the genetics of *Triticum vavilovi* Jakub.
Agron. J. 1957 : **49** : 4–11.

T. vavilovi was crossed reciprocally with *T. sphaerococcum* and the spring wheats *T. vulgare* 'NP165', 'NP114' and 'WR113'. All crosses were successful, the F_1 hybrids being normal in seed fertility. Most of the F_2 plants were highly pollen fertile but partly sterile individuals occurred in some crosses, particularly in *T. vavilovi* x *T. sphaerococcum*, some of the F_2 plants of which were completely seed sterile. The elongate rachilla characteristic of *T. vavilovi* probably depends upon two pairs of recessive genes. All segregates with the *T. vavilovi* type of spikelet were speltoid, as a result, it is suggested, of close linkage, or identity, of one of these genes with *q* for the speltoid condition on chromosome IX. The basal sterility affecting the florets in some F_2 segregates of the crosses with *T. sphaerococcum* and WR 113 was determined by a single recessive gene. Branched spikelets were observed in some segregates of the cross with NP 114. *T. sphaerococcum* x *T. vavilovi* F_2 segregates included some resembling either *T. sphaerococcum* or *T. vulgare* in ear characters; these types differed by a single gene. Spelting was monogenic and dominant to nonspelting. Spike density and spring *vs.* winter habit depended upon several genes. In the cross of *T. vavilovi* with WR113 (nonglaucous), glaucousness of the glume was dominant and dependent upon two duplicate factors. As indicated by data from the crosses with NP165 and *T. sphaerococcum*, the glume pubescence of *T. vavilovi* was monogenic and dominant; no association was detected between pubescence and awn length. The data suggested that NP165, NP114, *T. sphaerococcum* and *T. vavilovi* had respectively the genotypes $b_1{}^a b_1{}^a B_2 B_2$, $b_1 b_1 b_2 b_2$, $b_1 b_1 b_2 b_2$ and $B_1 B_1 b_2 b_2$ for awning, according to the symbols proposed by Watkins and Ellerton (cf. *PBA*, XI, Abst. 937). Incurving of the awns in the particular strain of *T. sphaerococcum* used was a simple recessive to the straight-awned condition. The gene for awn curving was distinct from *s* for reduced awn length in *T. sphaerococcum* but closely associated with it. In general, the data suggest that *T.*

vavilovi is more closely related to *T. vulgare* than its external appearance may indicate.

2789 Klimov, L. I.
(A high-yielding variety of hard spring wheat).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1957 : No. 1 : 20–21. [Russian].

A description is given of Narodnaja [People's], which was made a standard in the Penza province in 1952. In recent trials it has out-yielded all other hard wheats and exceeded them in earliness. It is distinguished by larger grain than Melanopus 69, good baking and milling properties and resistance to shedding, lodging, pests and diseases, in particular smut and rust.

2790 Pesola, V. A.
Jokioisten Vakka-syysvehnä. **(The Jokioinen winter wheat Vakka).**
Koetoim. ja Käytäntö 1955 : **12** : 25–26.

The variety Vakka (Bushel), which originated from a cross between the Tammisto winter wheat Varma (Sure) and the Estonian line G5/20, is described. Data are given comparing its yield in various localities with Varma and other varieties, and on its agronomic qualities in experiments at Jokioinen. Vakka is hardy, high yielding, strong strawed, early and fairly resistant to disease. Its weaknesses are a tendency to shed and sprout in the ear.

2791 Mac Key, J.
Svalöfs Safirvårvete. **(The Svalöf spring wheat Safir).**
Allmänna Svenska Utsädesaktiebolaget Svalöf 1957 : 6–8.

Developed from a cross between Sv.01015 (Extra-Kolben I x Brunt Schlanstedt) and Ä24/585 (Svalöfs Kolben x Brunt Schlanstedt), Safir [Sapphire] equals Pondus in yield in southern Sweden, resembles Kärn II [Kernel II] in grain quality and has high straw strength and resistance to shattering, rendering it well adapted to mechanical harvesting.

2792 Kihara, H., Yamashita, K. & Tanaka, M.
A new strain of *Triticum polonicum*.
Wheat Inform. Serv. Kyoto 1956 : No. 4 : p. 3.

A brief description of *T. polonicum* var. *erediviánum*, from Iran, is given. The variety differs from *T. polonicum* in its semidwarf habit and hollow straw and in several ear characters. The ears are small, slender and fragile, the empty glumes are not papery and the grains are small.

2793 Valdeyron, G.
De quelques conclusions d'ensemble sur les dernières campagnes d'expérimentation céréalicole. **(Some general conclusions on recent research on cereal growing).**
Tunis. agric. 1957 : **58** : 3–23.

Information is included on the yielding capacity and baking quality of the principal varieties of hard and soft wheat grown in Tunisia and varietal differences in resistance to frost and mealy endosperm are noted (cf. *PBA*, XXVI, Abst. 2228).

2794 Borlaug, N. E. *et al.*
Los mejores trigos para 1956–57. **(The best wheats for 1956-57).**
Agric. téc. Méx. 1956–1957 : No. **3** : 3–5, 32–33.

Descriptions and illustrations are given of a number of varieties tested in different parts of Mexico in 1955–56. Special mention is made of the new variety Lerma Rojo [Red Lerma], referred to in Abst. 1627, for its high yields and resistance to races 29, 48, 49 and 139 of stem rust and to the prevalent races of leaf and stripe rust, combined with fairly good standing capacity and high resistance to shedding.

2795 Unrau, J.
Can 2,4-D cause hereditary changes in treated crop plants ?
Pr. Bull. Alberta Univ. Ext. Dep. 1954 : **39** : p. 1.

In investigations at the University of Alberta, applications of 2,4-D to *T. vulgare* 'Thatcher', *T. durum* 'Stewart' and the barley Olli induced a fairly high frequency of chromosomal aberrations, as shown by examination of pollen meiosis. Plants treated at different stages of development and with different concentrations (8 and 16 oz. of acid equivalent in 40 gallons of water per acre) did not show any marked disparities in frequency of aberrations. In a further study of Thatcher, progenies of treated plants were found to include off-types which were mostly due to chromosomal irregularities. The herbicide should not be used in the production of certain classes of pedigree seed.

2796 Sikka, S. M., Swaminathan, M. S., Singh, M. P. & Pal, B. P.
Monosomic analysis of some characters in the wheat variety Cometa Klein.
Indian J. Genet. 1956 : **16** : 24–28.

The results of preliminary studies at the Indian Agricultural Research Institute, New Delhi, of

F_1 plants from crosses between 21 different monosomic lines of Chinese Spring and Cometa Klein [Klein Comet] suggest that Cometa Klein carries (1) a recessive gene *a* for awn development and possibly some factors for chromosome synapsis on chromosome III, (2) the recessive alleles of the awn suppressor genes *Hd* and B_2 on chromosomes VIII and X respectively and (3) factors for ear shape on chromosome IX.

2797 Ljaščenko, I. F.
(Hybrids between alternative wheats and winter wheats).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1956 : **17** : 296–301. [Russian].

Observations on the F_1 and F_2 from direct and reciprocal crosses at Rostov University are reported. Some F_1 hybrids showed maternal inheritance with regard to vegetative period, but most behaved like spring wheats. All hybrids overwintered well when sown in autumn. Some F_1 plants differed morphologically according to whether they were sown in spring or winter; for instance a hybrid between two awned forms had awns when spring sown but not when winter sown.
All the F_2, including the progeny of F_1 winter forms, were characterized by the spring habit. Some hybrids grown as winter wheats for three generations still behaved as spring wheats when spring sown in the fourth generation.

2798 Glinjanyĭ, N. P.
(Heritable change of the spring wheat variety Marquis into a winter form).
Agrobiologija (Agrobiology) 1956 : No. 4 : 46–55. [Russian].

An account of experiments at Alma Ata mentions a shift in photoperiodic requirements effected in some Marquis plants by autumn sowing. On sowing on 11 April or 30 April respectively they eared 10 days or 25–28 days later than the normal spring types of this variety, while 7% of them behaved like true winter wheats.

2799 Ukolov, A. A.
(Forms of hard winter wheats).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 4 : 13–16. [Russian].

A *Triticum turgidum* variety was open pollinated with several soft winter wheats and then supplementarily pollinated with the pollen of another *T. turgidum* form at the Timirjazev Agricultural Academy. The progeny showed great variability and included some hard wheat forms with 28 chromosomes. Hardy, awned and awnless forms, which produced upwards of 4 g. grain per ear, have been selected. Some selected families are notable for large grain.

2800 Filippenko, I. A.
(The effect of 2,4-D upon form development in spring wheat).
Fiz. Rasten. (Phys. Pl.) 1956 : **3** : 440–45. [Russian].

The wheat Moscow 48, sprayed with 2,4-D during the phase preceding shooting, developed branched stems and ears and had anomalously arranged spikelets and one floret bore twin embryos. The possibility of the changes being heritable is being investigated.

2801 Hudjak, M. I.
(A description of the development of the endosperm in Kahetian branched wheat).
Bot. Ž. (Bot. J.), Kiïv 1955 : **12** : No. 3 : 52–67. [Ukrainian].

Cytological observation of embryo sacs of the above variety showed that some endosperm cells arose from the cytoplasm. At first these cells had no nuclei. Later nuclei arose, sometimes more than one, within a cell. The nuclei divided mitotically.

2802 Kubulov, D. T.
(A large-grained wheat from Uzbekistan).
Priroda (Nature), Leningrad 1957 : No. 1 : 99–100. [Russian].

A description is given of a new wheat obtained by single-plant selection from a local form of *Triticum turgidum* in Samarkand province. The 1000-grain weight is 70–72 g. and the ears are 9–12 cm. long. In both these respects the new wheat resembles the local variety Tjuja-Tiš, but it has more productive ears; the average weight of grain per ear is 4·2 g., with a minimum of 3·6 g. and a maximum of 5·2 g. On irrigated land it yields up to 48 c. per ha. and is free from lodging.

2803 Ikeda, T.
(On the degree of crystalloid structure in hard-wheat endosperm).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1956 : **25** : 88–89. [Japanese].

Hardness can be determined by observing the degree of transparency of the flour under a polarizing microscope. All the samples from *Triticum durum* and *T. polonicum* examined in

this way were determined as hard, and some samples of *T. vulgare.*

2804 Mamontova, V. N. & Marušev, A. I.
("Strong" wheats in the south-east).
Zemledelie (Agriculture) 1956 : No. 4 : 77–78. [Russian].

Strong-floured wheats, mainly older varieties, and a few newly bred forms from Saratov are described. The latter include Albidum 1541, Saratov 29 and Lutescens 1475. The first mentioned variety is resistant to drought, equals Sarrubra in baking quality and Albidum 43 in productiveness. The others give high yields, have large vitreous grain and are resistant to lodging, shedding and loose smut. The baking and milling properties of Lutescens 1475 are as good as those of Lutescens 758, which it surpasses in earliness and yield.

2805 Samsonov, M. M. & Žarova, E. N.
(The effect of parental components upon grain quality).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 4 : 49–52. [Russian].

A number of Soviet-bred spring and winter wheats with excellent or good baking properties are mentioned. Most are hybrids between high-quality bread wheats. Lutescens 758, Moscow, Milturum 553 and Milturum 13 are the best among the spring wheats. All these are hybrids of Kitchener with such varieties as Lutescens 62, Tulun 70 and Milturum 321. Most of the strong-floured winter wheats are older varieties such as Sarrubra, Novoukrainka 83 (Ukrainka x Marquis) and Novoukrainka 84, obtained from the latter by single plant selection.

2806 Pool, M.
The effect of the delay accompanying the use of the combine harvester on the physical and chemical properties of soft red winter wheat.
Diss. Abstr. 1956 : **16** : Publ. No. 16,486 : 1036–37.

Significant varietal differences in the effects of delayed harvesting upon grain and flour qualities and significant interactions of variety x duration of the delayed harvest period indicated scope for breeding for greater suitability for reaping by combine. Awnedness and nonwaxy glumes were more conducive to faster drying of the grain under field conditions than the awnless condition and waxy glumes; the first-mentioned characters therefore possess selection value in breeding. A laboratory technique was developed to simulate conditions during delayed harvest.

2807 Labounek, V.
Vliv výnosových faktorů na produktivnost ozimé pšenice při různé hustotě setby. **(The influence of yield factors upon the productiveness of winter wheats sown at various rates).**
Sborn. čsl. Acad. zeměd. Věd. Řada rostlinná Výroba 1956 : **29** : 1209–22.

In the 1953–54 trials at Brno, Česká Přesívka [Czech Alternative] outyielded the winter wheats Pyšelka and Židlochovická Osinatka [Lax-eared Awned], this being accounted for by the greater hardiness of Česká Přesívka in a season with an exceptionally severe winter. In the case of Pyšelka, which has a compact awnless ear, the lack of hardiness was to some extent compensated by good tillering and larger numbers of spikelets and grains per ear. Ear length and large grain were the chief factors determining the productiveness of Židlochovická Osinatka, which is notable for earliness and drought resistance.

2808 Kagan, Ja. L.
(Yield structure, an important characteristic in the choice of winter wheat varieties for different environments).
Zemledelie (Agriculture) 1956 : No. 12 : 39–44. [Russian].

Lithuanian trials in districts with poor and rich soil showed that thick stand and productive tillering are responsible for the productivity of such varieties as Dotnuvskaja 458, while the productivity of others, such as PPG1 [Wheat-*Agropyron* Hybrid 1], is accounted for by productive ears. The first mentioned varieties outyielded the others on poor soil, but on rich soil the position was reversed.

2809 Čigrin, V. V.
(Growing Hybrid 481 under Crimean conditions).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 4 : 53–55. [Russian].

Hybrid 481 [(Illini Chief x Kanred 242253) x Hostianum 237] was bred at the Stavropolj Breeding Station. In Crimean trials it outyielded the winter wheat Vorošilovskaja and had larger grain and better baking quality. It is resistant to scorching at high temperatures and superior to Vorošilovskaja with regard to drought resistance and resistance to *Phytophaga* and *Puccinia.*

2810 Koller, J. & Heinen, A.
Étude sur la résistance au froid des céréales à la Station d'Essais de Chaux-des-Prés (1950–1956). (**Study on the cold resistance of cereals at the Chaux-des-Prés Experimental Station, 1950-56**).
Bull. tech. Ing. Serv. agric. 1957 : No. 116 : 37–45.

Tabulated data are presented on the relative frost resistance of a wide range of winter wheats tested at the above station, which is situated in eastern France. Alsace 22 and the American variety Minhardi proved the most resistant. Minhardi has been crossed with a number of French varieties and the F_2 of these crosses are now under observation.

2811 Karapetjan, V. K.
(**Winter hardiness and frost resistance of soft wheats obtained by training hard spring and semiwinter hard wheats**).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1956 : No. 23 : 181–89. [Russian].

Data on overwintering and tolerance of low temperatures of some soft wheats obtained at Gorki Leninskie by training hard wheats for the winter habit are presented. The hardiest among them was a soft wheat originating from Palestinian 6 that had been sown in autumn for several generations.

2812 Listowski, A.
O wpływie suszy jesiennej i wiosennej na rozwój i plenność odmian pszenicy ozimej. (**On the influence of drought during autumn and spring upon the development and productivity of winter wheat varieties**).
Roczn. Nauk rol. : Ser. A. : 1955 : **71** : 169–98.

In studies of the effects upon 13 winter wheats of periods of drought during autumn or spring, it was found that, where the individual varieties included plants derived from seed parents grown under various conditions, intravarietal variation in drought resistance was as great as intervarietal variation. Resistance to spring drought was increased after exposure to drought in autumn.

2813 Powell, L. M. & Pfeifer, R. P.
The effect of controlled limited moisture on seedling growth of Cheyenne winter wheat selections.
Agron. J. 1956 : **48** : 555–57.

Samples of seed (S_0) from 670 single-plant selections of Cheyenne were germinated in mannitol solutions having 7 and 11 atmospheres of osmotic pressure, measurements of epicotyl length being made at two-day intervals. Selections whose combined total for all the growth measurements at both osmotic pressures was above and below the average total for the 670 selections by at least 60 mm. were placed in a "high" and "low" group respectively. S_1 seed was obtained from the remnant S_0 seed, only selections falling in these two groups being further tested. The performances of the S_0 and S_1 seed were highly and positively correlated. Selections in the high group are expected to provide a useful basis for breeding for drought resistance.

2814 Nakagawa, M.
(**Studies on the resistance of wheat varieties to *Gibberella saubinetii*. VII. The relation between susceptibility to *G. saubinetii* and phosphate content**).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 115–16. [Japanese].

Using the same seven varieties as are mentioned in *PBA*, XXVI, Abst. 1175, a correlation was discovered between the presence of the factor *c* determining susceptibility to the above pathogen and the phosphate content of the grain.

2815 **New bread wheat released in northwest.**
What's New Crops Soils 1957 : **9** : No. 5 : p. 23.

Jointly released by the Washington and Oregon Agricultural Experiment Stations, Burt is a smut-resistant, hard, white winter wheat recommended for areas in the Pacific Northwest where the hard red wheat Columbia is not adapted. It is short, stiff strawed and bearded and yields better than Rio, one of its parents.

2816 Kendrick, E. L., Metzger, R. J. & Rohde, C. R.
A possible new source of high resistance to wheat smut.
Phytopathology 1957 : **47** : p. 19. (Abst.)

Among wheat varieties screened for resistance to *Tilletia* spp., an introduction from Turkey, PI 178383, has been found to be resistant to all 27 known races and others have shown a high degree of resistance.

2817 Kovács, A.
Fokozható-e a búza kőüszögellenállósága fajtán belüli tömegkiválasztással? (**Is it possible to increase bunt resistance in wheat by intravarietal mass selection ?**).
Növénytermelés 1956 : **5** : 153–58.

After three years' selection of healthy plants

within each of eight varieties grown in infected plots, the selected material showed no improvement in bunt resistance over the original varieties. Selection of susceptible plants was also without effect upon bunt reaction and it is concluded that this method of selection is not suitable for increasing bunt resistance within varieties.

2818 KENDRICK, E. L.
Pigmentation of the culture medium as an indicator of sex compatibility in *Tilletia caries*.
Res. Stud. St. Coll. Wash. 1956 : **24** : 337–42.

Association between pigment production in agar culture and compatibility has been observed in races T–16, T–10 and T–15 of *T. caries*, lines producing pigment being of the opposite sex to those not producing pigment. No such association occurs in race T–9 and in those races where it does occur it is not sex specific. The bearing of this phenomenon on the determination of compatibility relationships is discussed (cf. *PBA*, XXVI, Abst. 2098).

2819 KENDRICK, E. L.
The effect of culture temperature on the sex-associated pigmentation phenomenon in monosporidial lines of *Tilletia caries*.
Phytopathology 1957 : **47** : p. 19. (Abst.)

Pigment-producing lines of *T. caries* were found to produce pigment at all temperatures, although the rate of production was greater at higher temperatures, while some of the nonpigmenting lines were found to produce pigment after transfer from one temperature to another.

2820 FORSYTH, F. R.
Effect of ions of certain metals on the development of stem rust in the wheat plant.
Nature, Lond. 1957 : **179** : 217–18.

Zn, Mn and Co ions had the effect of rendering seedlings of stem-rust resistant varieties susceptible to this disease. Since the effect of the ions was not specific for any particular genetic type of resistance, the biochemical basis of resistance may be qualitatively similar but quantitatively dissimilar in different varieties. Addition of ferric ions to the nutrient solution led to resistance in normally susceptible plants.

2821 SALAZAR Y VIGIL DE QUIÑONES, J.
Las royas del trigo. (**The wheat rusts**).
Rev. Inst. agríc. catal. 1956 : **105** : 246–50.

Descriptions of the leaf, stem and yellow rusts of wheat are given, the occurrence of different physiological races of the pathogens is discussed and some varietal differences in reaction to four stem-rust races are noted. Fourteen wheats resistant to the most prevalent races of stem rust in Spain, nine resistant to the leaf rusts and three resistant to yellow rusts are listed.

2822 LEBEAU, F. J., SOSA, O. M. & FUMAGALLI, A.
The striped rust in Guatemala during 1956.
Robigo, Castelar 1956 : No. 2 : 2–3; also in Spanish, p. 2. (Mimeographed).

The wheat varieties Mentana, Kenya Farmer, Chapingo 53, Lerma 52 and Kentana 54B and the cross Supremo x Kenya x Mida have proved highly resistant to *Puccinia glumarum* in Guatemala in 1956.

2823 CAMPBELL, A. B.
Quality defects from Kenya Farmer.
Robigo, Castelar 1956 : No. 2 : p. 18; also in Spanish, p. 18. (Mimeographed).

Two spring-wheat back-cross derivatives from Thatcher and Lee, both involving Kenya Farmer as a source of resistance to *Puccinia graminis* var. *tritici*, have been tested against their recurrent parents at the Cereal Breeding Laboratory, Winnipeg, and were found to be slightly inferior in respect of physical dough properties but equal in other respects.

2824 PUGSLEY, A. T.
Resistance of Oro wheat to stem rust.
Robigo, Castelar 1956 : No. 2 : 12–13; also in Spanish, p. 13. (Mimeographed).

Studies of Oro, Baart and F_2 and F_3 families of an Oro x Baart cross at Wagga, New South Wales, indicate that the resistance of Oro to *Puccinia graminis* var. *tritici* is controlled by a single dominant gene.

2825 SMITH, G. S.
Inheritance of stem rust reaction in tetraploid wheat hybrids: I. Allelic genes in Mindum durum x Vernal emmer.
Agron. J. 1957 : **49** : 134–37.

Studies at the N. Dakota Agricultural College of F_1, F_2 and F_3 progenies of the above cross indicate that field reaction to races 17 and 147 of *Puccinia graminis* var. *tritici* is determined by allelic or closely linked genes. It is suggested that the genes be designated Sr^v and Sr^m, Vernal being homozygous for Sr^v and possessing

resistance to race 17, and Mindum being homozygous for Sr^m and possessing resistance to race 147. The F_1 therefore possesses both genes and is resistant to both races, but does not breed true.

2826 Kiss, Á.
Vizsgálatok (*T. timopheevi* x *T. durum*) x *T. aestivum* hármas hibrideken. [**Studies on triple hybrids of (*T. timopheevi* x *T. durum*) x *T. aestivum***].
Növénytermelés 1956 : **5** : 121–30.

Direct crossing of *Triticum timopheevi* with *T. aestivum* resulted in a poor seed set of 0·4% but crossing of hybrids of *T. timopheevi* x *T. durum* with *T. aestivum* gave 2·2–36·4% seed set, all the F_1 plants being of the *T. aestivum* type while the F_2 progeny varied widely and included speltoid as well as parental forms. Resistance to stem and leaf rusts in the triple hybrids was generally associated with other *T. timopheevi* characters and was not retained in *T. aestivum*-like plants beyond the F_3 generation. The grains from F_1 plants of *T. timopheevi* x *T. aestivum* fell into two groups, the one consisting of shrivelled seeds, which gave plants mainly of the *T. aestivum* type and a single plant of a new type with a bluish black ear, and the other of full seeds giving intermediate forms.

2827 Miller, J. D.
Studies on phenotypic variability and identification of subraces within race 29 of *Puccinia graminis* var. *tritici*.
Phytopathology 1957 : **47** : p. 24. (Abst.)

The existence of at least four subraces within race 29 of *P. graminis* var. *tritici* has been confirmed by the use of additional differential wheat varieties.

2828 Hassebrauk, K.
Die physiologische Spezialisierung des Weizenbraunrostes (*Puccinia triticina* Erikss.) in Deutschland im Jahre 1954. [**Physiological specialization of brown rust of wheat (*P. triticina* Erikss.) in Germany in the year 1954**].
Z. Pflanzenz. 1957 : **37** : 96–98.

Race 17 was present in 80% of the 164 samples obtained from 86 different localities and race 1 was present in 30%. Ten other races were also identified.

2829 Basile, R. & Leonori-Ossicini, A.
Razze fisiologiche di *Puccinia rubigo-vera tritici* (Erikss. et. Henn.) Carl. (= *P. triticina* Erikss.) in Italia, nel 1953–1954. [**Physiological races of *P. rubigo-vera* var. *tritici* (Erikss. et Henn.) Carl. (= *P. triticina* Erikss.) in Italy in 1953-1954**].
Boll. Staz. Pat. veg. Roma 1957 : **14**: 13–19.

Of the 11 races identified during 1954 six are new to Italy and one of these, designated 163, which attacks Loros and Mediterranean, appears to be new altogether (cf. *PBA*, XXVI, Absts. 342–3).

2830 Johnson, T.
Physiological races of leaf rust of wheat in Canada 1931 to 1955.
Canad. J. agric. Sci. 1956 : **36** : 371–79.

Changes in the pattern of distribution of the physiological races of *Puccinia triticina* during the period under review are described and discussed with reference to the selective effect of the wheat varieties in cultivation at any given time in Canada and adjacent areas of the USA.

2831 Johnston, C. O. & Huffman, M. D.
Physiologic races of the leaf rust of wheat in the United States in 1955.
Plant Dis. Reptr. 1957 : **41** : 115–16.

Tabulated data are provided showing the incidence of the different races of *Puccinia rubigo-vera* f. sp. *tritici* in 30 states in 1955. Race 5 was most abundant, comprising 26·9% of the total isolates.

2832 Villanueva, R.
Origen de la variedad de trigo Helvia. (**Origin of the wheat Helvia**).
Bol. trimestr. Exp. agropec., Progr. Coop. Exp. Agropec., Lima 1956 : **5** : No. 1 : 25–28.

A hybrid from María Escobar x H44-Marquis CI11782, the wheat Helvia (cf. Abst. 1635–6) is now the most popular variety in Peru; though both its parents are susceptible to stem rust, Helvia is highly resistant to races 14, 17 and biotypes of 15B of this rust as well as to leaf rust, yellow rust and mildew; it is also distinguished by high yielding ability and satisfactory baking quality.

2833 Swaebly, M. A.
Variability in the infection of wheat by *Puccinia graminis tritici* and studies on extracts from rust uredio-spores.
Diss. Abstr. 1956 : **16** : Publ. No. 15,984 : 843–44.

Three biotypes of race 15B showed different pathogenic capacities upon the Emmer wheat Khapli, as indicated by histological observations. Kentana varied in its reaction to races 11 and 15B according to the temperature, development of the fungus being favoured by high temperature (80–85° F.). A heat-labile substance toxic to seedling leaves of cereals and a heat-stable substance stimulating germination of old uredospores were extracted from germinating uredospores.

2834 Hosni Abdel Rahman Mohamed
Comparative studies of races 49 and 139 of *Puccinia graminis* var. *tritici* Erikss and Henn.
Diss. Abstr. 1956 : **16** : Publ. No. 16,559 : 1035–36.

Differences in the pathogenicity of races 49 and 139 and their subraces upon wheat varieties at different temperatures are described.

2835 Santiago, J. C.
The effect of environmental factors on some physiologic races of *Puccinia graminis tritici* prevalent in Portugal.
Melhoramento 1956 : **9** : 49–96.

It has been found in studies carried out at St. Paul, Minnesota, that temperature and light both have a marked influence on the expression of infection by different races of *P. graminis* var. *tritici* shown by different wheat varieties. Not all races of the pathogen could be distinguished at all temperatures; for example races 14 and 48B resembled races 17 and 32 respectively at 85° F, but in other cases the effect of temperature on the host-parasite system is so specific that it can be used to distinguish biotypes within a race.

Some host-parasite combinations were found to be sensitive to light intensity and day length, a reduction in either or both resulting in either a decrease in the number or degree of development of infection centres or stimulation of the development of telia. The development of infection by some races was affected by the wave length of light used, a marked reduction in the number of lesions produced by race 21 on several varieties under blue or green light being observed. The bearing of this work on the methods used in testing for rust resistance in wheat breeding is discussed.

2836 Halim Massoud Hilu
Inoculation, life cycle and host-parasite relationship of *Septoria tritici* Rob. on *Triticum* species.
Diss. Abstr. 1956 : **16** : Publ. No. 18,150 : p. 1550.

The following information is briefly included. Under greenhouse conditions, all the varieties of *T. vulgare* tested were susceptible to *S. tritici* whereas the reactions of varieties of *T. durum* ranged from susceptible to resistant. The pathological histology is described as the result of a study of CI12557, Kubanka and Arnautka (= Arnaut), susceptible, intermediate and resistant, respectively. The fungus penetrated the leaves of all three varieties but failed to develop in the last two, in which growth of the hyphae was also slower.

2837 Purdy, L. H.
The nature and extent of mercury injury and associated anatomical responses in wheat seedlings.
Res. Stud. St. Coll. Wash. 1956 : **24** : 343–47.

Red Bobs and Rio are more tolerant of Ceresan M than Brevor and Omar, especially at higher rates of application.

2838 **Leaf rust resistance bred into new wheat.**
What's New Crops Soils 1957 : **9** : No. **4** : p. 22.

The substance of this article has been summarized in Abst. 372.

2839 Remy Padilla, J. & Rodríguez E., M.
Reconocimiento de variedades de trigo por métodos colorimétricos. (**The identification of wheat varieties by colorimetric methods**).
Agronomía, Lima 1956 : **22** : No. 86 : 87–95.

On the basis of the colour reaction obtained by treatment of soaked grains with a 2% solution of phenol in alcohol, five colour classes could be distinguished among 44 varieties, some varieties being more variable in reaction than others. The colour reaction was not correlated with any of the morphological characters investigated. It is suggested that the method may be of use in determining varietal purity and in distinguishing between morphologically similar varieties. Similar but less well defined colour reactions were obtained when hydroquinone solution was used instead of phenol.

Data on varietal reaction to treatment and on the origins of the varieties indicated that the colour reaction is multifactorially determined.

2840 Tanaka, M.
Amphidiploid from the hybrid, *Aegilops umbellulata* 4*x* x *Aegilops squarrosa* 4*x*.
Wheat Inform. Serv. Kyoto 1956 : No. 4 : p. 10.

The synthesis of an amphidiploid with the genome C^uC^uDD from the above cross is reported. The plant resembles *Ae. juvenalis* but chromosome pairing is not regular and seed fertility is poor.

2841 Tanaka, M.
Newly synthesized amphidiploids from the hybrids among diploid species in *Aegilops*.
Wheat Inform. Serv. Kyoto 1956 : No. 4 : 10–11.

The synthesis of the following amphidiploids is reported: *Ae. umbellulata* 4*x* x *Ae. bicornis* 4*x* ($C^uC^uS^bS^b$), *Ae. comosa* x *Ae. bicornis* (MMS^bS^b) and *Ae. umbellulata* 4*x* x *Ae. squarrosa* 4*x* (C^uC^uDD) (cf. Abst. 2840). In all cases $n = 14$.

2842 Muramatsu, M. & Sakamoto, S.
F_1 hybrids between three species of *Aegilops* and *Agropyron intermedium*.
Wheat Inform. Serv. Kyoto 1956 : No. 4 : 14–15.

Hybrids have been obtained between *Ae. longissima*, *Ae. cylindrica* and *Ae. variabilis* with *A. intermedium*. In the first hybrid the chromosome number was $2n = 28$ and in the other two $2n = 35$ and the average chromosome configurations at metaphase I for the respective hybrids were: $0{\cdot}07_{IV} + 1{\cdot}1_{III} + 6{\cdot}7_{II} + 10{\cdot}9_{I}$ with 3–4 ring shaped bivalents; $0{\cdot}1_{IV} + 0{\cdot}9_{III} + 6{\cdot}9_{II} + 18_{I}$; and $0{\cdot}5_{III} + 6{\cdot}5_{II} + 20{\cdot}9_{I}$ with a chromosome fragment present in every cell examined. The presence of 6–7 bivalents is taken to indicate autosyndesis between the genomes of *A. intermedium* and the wide fluctuations in the number of bivalents to indicate the occurrence of some allosyndesis between the genomes of the species of *Aegilops* and *Agropyron* involved.

2843 McGinnis, R. C. & Melnyk, J. H.
Cytological evidence for the S genome in *Aegilops juvenalis*.
Wheat Inform. Serv. Kyoto 1956 : No. 4 : p. 8.

Hybrids of *Ae. juvenalis* with *Ae. speltoides* and *Ae. aucheri*, which possess the S genome, gave a much higher pairing frequency than hybrids with *Ae. sharonensis* and *Ae. longissima*, which possess the S^l genome. This is taken to indicate the presence of the S genome in *Ae. juvenalis* and it is suggested that the genome formula for this species is C^uDS.

BUCKWHEAT

2844 Pauševa, Z. P.
(The biology of flowering and fertilization of buckwheat).
Agrobiologija (Agrobiology) 1956 : No. 4 : 62–69. [Russian].

Self pollination prolonged the growth and flowering periods and promoted extensive branching and development of many flowers under Moscow conditions. Daily legitimate pollination improved grain setting. Legitimate pollination of some flowers on a plant diverted the flow of nutrients to these from those that had been selfed and thereby caused the latter to wilt.

2845 Tatebe, T.
(Physiological studies on fertility in buckwheat. V. Studies on the behaviour of the pollen and pollen tube).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 156–62. [Japanese].

Data are provided on rate of pollen-tube growth, incidence of swellings at the pollen-tube tips and frequency of pollen-tube bursts in legitimate and illegitimate pollinations (cf. *PBA*, XXV, Abst. 2960).

OATS

2846 Vinogradova, N. M.
(The oat Nemčinovskiĭ 1).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 5 : 45–46. [Russian].

The variety described, a hybrid of Orel [Eagle] x Moskovskiĭ A315, possesses strong straw, resistance to the main fungous diseases and large white grains, with high protein and fat contents and a husk percentage of 24–27. In the five years 1949 to 1953 its average yield of 38·4 c. per ha. compared favourably with 34·1 c. from the variety Dippe. It did particularly well in dry years and the grain was free from shedding.

2847 Zweifel, J. & Pugnat, C.
Résultats d'essais comparatifs de variétés d'avoine. **(Results of comparative trials of oat varieties).**
Rev. rom. Agric. 1957 : **13** : 1–4.

Data are presented on the yields of grain and

straw, period to maturity and resistance to lodging and frit fly of eight varieties tested at a number of centres in eastern Switzerland in 1952–55.

2848 **Crater oats resist lodging.**
What's New Crops Soils 1957 : **9** : No. 4 : p. 23.

A stiff-strawed grey winter oat, named Crater, has been released by Oregon State College. Selected from Fulghum x Custis, its average yield over five years was slightly less than that of Grey Winter but its resistance to lodging was consistently higher.

2849 Miles, L. G.
Oats for grazing. Results of some trials in south-eastern Queensland.
Qd. agric. J. 1956 : **82** : 561–72.

A popular account of trials of oat varieties for grazing in the Gympie and Brisbane districts is given. All of the older Australian varieties tested, such as Belar, Mulga, Fulghum and Algerian, proved resistant to Victoria blight. Both Bovah (cf. *PBA*, XXV, Abst. 255) and Benton (cf. *PBA*, XVII, Abst. 101) have displayed resistance to the new race of crown rust, to which Vicland succumbed in 1954. Bovah has remained unaffected by Victoria blight. Benton has only recently been included in the trials; its parentage suggests that it may also be resistant to Victoria blight.

2850 McIntosh, T. P.
Identifying oat varieties by grain characters.
J. Inst. Corn. Merch. 1957 : **6** : 27–37.

Following his paper on the identification of Svalöf oat varieties (cf. *PBA*, XXVI, Abst. 2256), the author describes here the diagnostic features of the grains and groats of a number of other varieties commonly grown in Britain. A key for identification is provided and illustrated by means of photographs.

2851 Antonov, A.
Správným výběrem odrůd a dokonalou agrotechnikou k vyšším výnosům ovsa. **(For higher oat yields by correct selection of varieties and the use of advanced agricultural methods).**
Za vysokou Úrodu 1957 : **5** : 111–13.

Standard varieties for different districts of Czechoslovakia with high grain quality, low husk percentage or resistance to *Ustilago* and lodging are described.

2852 Hagberth, N. O.
Palu och Pendek, två nya havresorter. **(Palu and Pendek, two new oat varieties).**
Weibulls ill. Årsb. 1957 : **52** : 15–17.

The Danish variety Palu, developed at Abed from Örn [Eagle] x Minor, has very stiff straw and has almost equalled Blenda in yield in Swedish trials held in 1953–55. The grain is white and of good quality. The early Netherlands variety Pendek (cf. *PBA*, XXVI, Abst. 1204) has short stiff straw but is somewhat low yielding.

2853 Frey, K. J. & Horner, T.
Heritability in standard units.
Agron. J. 1957 : **49** : 59–62.

"A modified parent-progeny regression procedure for calculating heritability percentages was illustrated using data for date of heading of oats. This method, which consists of calculating heritability in terms of standard units, tended to eliminate those environmental effects of different years which increase or decrease the range of the progenies relative to that of the parent. In effect it establishes a heritability ceiling of 100% in contrast to the conventional regression method which has a different ceiling for each experiment.

"In hypothetical selection experiments in the F_3 and F_4 generations the mean predicted and actual gains were 1·5 and 2·8 days in heading, respectively, when the heritability percentages were calculated by the conventional method. The standard unit method gave identical mean predicted and actual gains of 0·9 standard units. When the F_2 and F_4 were used the corresponding values were 2·4 and 2·6 days, respectively, with the conventional method, and 0·9 and 0·8 standard units, respectively, with the standard unit method."

[Authors' summary].

2854 Frey, K. J. & Wiggans, S. C.
Tillering studies in oats. I : Tillering characteristics of oat varieties.
Agron. J. 1957 : **49** : 48–50.

In investigations at the Iowa Agricultural Experiment Station, the tillering capacities of oat varieties from a world collection remained relatively constant from year to year and with different rates of planting. Although the mean number of tillers per plant was lower in spring than in winter varieties, some spring varieties produced nearly as many tillers as the winter varieties which showed the greatest tillering capacity. Tillering capacity and heading date

were not associated. Space-planted material was suitable for the determination of tillering ability.

2855 Dent, J. W.
The chemical composition of the straw and grain of some varieties of spring oats in relation to time of harvesting, nitrogen treatment and environment.
J. agric. Sci. 1957 : **48** : 336–46.

The author reports the results of an analysis of the straw and grain of the varieties Eagle, Onward and Milford, grown at six centres in England and Wales for three seasons at two levels of manuring and harvested at two stages of ripeness. The main interest of the trials was centred on straw composition, which was found to depend upon variety to only a negligible extent.

2856 Domańska, H.
Reakcja niektórych odmian owsa na nawożenie. (**The reaction of certain oat varieties to fertilizers**).
Roczn. Nauk rol. : Ser. A. : 1955 : **71** : 561–70.

Both light and heavy fertilizer applications resulted in marked increases in yield in late varieties but had only a slight effect upon the early oat Niemierczański Najwcześniejszy [Niemierczański Earliest].

2857 Halisky, P. M.
Inheritance of pathogenicity in *Ustilago avenae*.
Res. Stud. St. Coll. Wash. 1956 : **24** : 348–86.

A detailed study of the pathogenic reactions to oats of F_1 progeny and their F_2 derivatives from crosses of races A5, A6 and A7 has been carried out. The F_1 progeny were characterized by either 4 : 0 or 3 : 1 ratios of strongly pathogenic to weakly pathogenic hybrids. Selfing the 4 : 0 F_1 progeny produced F_2 derivatives showing the same ratio while selfing the 3 : 1 F_1 hybrids gave F_2 derivatives with 4 : 0, 3 : 1 and 2 : 2 ratios, indicating that the former type were homozygous and the latter heterozygous. These results are explained on a complementary factor basis, the strongly pathogenic dicaryons being characterized by *AABB*, *AABb*, *AaBB* or *AaBb* and the weakly pathogenic by *AAbb*, *Aabb*, *aaBb* or *aabb*.
The difference in pathogenicity of races A5 and A6 on Monarch was found to be controlled by a single gene pair, A5 being characterized by an *mm* genotype and A6 by an *MM* genotype. Similarly the difference in pathogenicity on Camas of races A6 and A7 is governed by a single gene pair, race A6 possessing a *cc* genotype and A7 a *CC* genotype. The existence of nonallelic factors governing pathogenic reactions on Monarch and Camas is indicated by the production of a hybrid dicaryon representing a new race of the fungus pathogenic to Camas but not to Monarch.

2858 Halisky, P. M. & Holton, C. S.
Genetic factors for pathogenicity in physiologic races of *Ustilago avenae*.
Phytopathology 1957 : **47** : p. 14. (Abst.)

The article summarized here by the authors has been summarized from another source in Abst. 1667.

2859 Browning, J. A.
Studies of the effect of field blends of oat varieties on stem rust losses.
Phytopathology 1957 : **47** : 4–5. (Abst.)

When grown in a mixed stand the combined yield from Clintland and Mo. 0–205 exceeded the average yields of the component varieties in pure stands when subjected to an induced epiphytotic of *Puccinia graminis* var. *avenae* race 7, to which the former variety is susceptible and the latter resistant.

2860 Rosen, H. R. & Bailey, L. F.
Relationship of reaction type in crown rust to the rate of carbohydrate metabolism in oats.
Phytopathology 1957 : **47** : p. 29. (Abst.)

Evidence is presented which suggests that the rate of carbohydrate metabolism of the host and the availability of carbohydrate metabolites to the parasite play an important part in determining the reaction of the host to infection by *Puccinia coronata*.

2861 Stewart, D. M., Roane, C. W., Loegering, W. Q. & Roberts, B. J.
A new subrace of the oat stem rust fungus from barberry.
Phytopathology 1957 : **47** : p. 34. (Abst.)

A new subrace of *Puccinia graminis* var. *avenae* race 5, found in Virginia and designated 5–US1, has been found to attack Saia oats, *Avena strigosa*, which has so far been resistant to all other isolates of race 5.

2862 Romanko, R. R.
The recovery from susceptible oats of the toxin produced by *Helminthosporium victoriae*.
Phytopathology 1957 : **47** : p. 29. (Abst.).
After standing for 12 hours in a buffered solution containing victorin, extracted from *H. victoriae*, susceptible oat varieties were noticeably wilted and were found to contain appreciable concentrations of victorin whereas resistant plants did not wilt and contained little or no victorin.

2863 Luke, H. H., Wallace, A. T. & Chapman, W. H.
A new disease symptom incited by the oat leaf blotch pathogen, *Helminthosporium avenae*.
Plant Dis. Reptr. 1957 : **41** : 109–10.
Symptoms in the sheaths and culms similar to those caused by *Septoria avenae* have been observed, during 1956, on oats in Georgia and Florida suffering from severe infection by *H. avenae*. Isolates from culm tissue were, with one exception, found to be pathogenic on all oat varieties tested but isolates from leaf tissue showed varying degrees of pathogenicity. Seminole and Floriland, while not showing complete resistance, were less susceptible than the other varieties tested.

2864 Johnston, P., Romanko, R. R. & Wheeler, H. E.
Association of the reactions to the crown rust fungus and to *Helminthosporium victoriae* in oat selections.
Phytopathology 1957 : **47** : 18–19. (Abst.).
A number of oat selections resistant to *H. victoriae* have been obtained after treatment of grain of susceptible varieties with a toxin produced by the fungus, the largest number being obtained from Arlington. These resistant selections gave a complete range of reactions to race 202 of *Puccinia coronata* with about 1% showing resistance equal to or greater than that of their parent varieties. This is taken to indicate that the inheritance of resistance to the two pathogens is of a more complex type than either simple linked factors or the pleiotropic effects of a single gene as has previously been suggested.

2865 **Oat disease battle waged in Illinois.**
What's New Crops Soils 1957 : **9** : No. **4** : p. **31.**
Selection for resistance to a virus disease of oats known as yellow dwarf or red leaf is being carried out at the Illinois Agricultural Experiment Station, with a view to incorporating resistance into high-yielding strains.

RYE

2866 Aguado, M.
Trabajos llevados a cabo durante el año agrícola 1954–55 sobre centenos. (**Work carried out in the year 1954-55 with rye**).
An. Inst. nac. Invest. agron., Madr. 1956 : **5** : 439–45.
Selection has been made for fertility (number of grains per ear) and for self fertility.
Hybrids with wheat have been most successful when the embryo of the wheat parent was previously grafted on to a rye endosperm, after moistening for 12 hr. In this way 44 hybrids between rye and Candeal wheat have been produced.
Good yields have been obtained from tetraploid rye.
Chromosome aberrations have been observed in plants raised for 20 days on a Knop solution containing P^{32}.

2867 Laube, H. A.
Vergleichende Untersuchungen zur Entwicklungsphysiologie am Petkuser Normalstroh-Roggen (2n) und Petkuser Tetraroggen (4n). [**Comparative studies on the physiology of development in Petkus normal-strawed rye (2*n*) and Petkus tetraploid rye (4*n*)**].
Z. Pflanzenz. 1956 : **36** : 305–62.
Diploid and tetraploid strains of Petkus winter rye grown under greenhouse conditions reacted differently to vernalization and photoperiod, the 4*n* plants proving more sensitive to vernalization, day length and light intensity than the 2*n* plants. Tetraploid plants displayed pronounced long-day characteristics, and tillering and seed set were more adversely affected by a photoperiod of less than 16 hr. than was the case with diploid plants. By means of a 40-day vernalization period, followed by a 16-hour photoperiod provided by fluorescent lighting, it was found possible to raise two generations of rye, either of the diploid or tetraploid kind, in one year. Although vernalization reduced the vegetative period prior to earing when employed in conjunction with long-day treatment, it had no effect when the plants were subsequently grown under short-day conditions. Studies of the pollen of vernalized plants grown under

long-day conditions showed that their viability was not impaired.

2868 Nakajima, G.
(Cytogenetical studies on interspecific hybrids of rye. II. Meiosis in pollen mother cells of the F_1 between *Secale cereale*, on the one hand, and *S. Vavilovii*, *S. africanum* and *S. montanum*, on the other).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 171–74. [Japanese].
Meiosis in the three interspecific combinations referred to is quite regular, the modal bivalent frequency being 7_{II} in each case. Occasional univalents, multivalents and laggards were also observed (cf. *PBA*, XXV, Abst. 2972).

2869 Stutz, H.
The origin of rye.
Proc. Utah. Acad. Sci. 1956 : **33** : p. 175. (Abst.).
All the species of *Secale* examined had $2n = 14$. Hybrids between annual species and hybrids between perennial species were meiotically regular. In hybrids between annual and perennial species, a translocation configuration involving six chromosomes was found. Evidence was obtained in favour of the view that this configuration resulted from "separate translocations within an ancestral pattern" rather than from two consecutive translocations. It is suggested that *S. cereale* arose from wild, weed types by selection and that these originated through hybridization between a perennial species (unspecified) and the annual *Secale sylvestre*.

2870 Nakajima, G.
Chromosomes of *Secale kuprijanovi* Grossh.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1954 : **67** : 69–72.
Chromosome morphology and meiosis in the above species were investigated. There are $2n = 14$ chromosomes, all similar in size; meiosis is regular.

2871 Nakajima, G.
(The chromosomes of *Secale fragile* and two varieties of *S. montanum*).
Senshokutai (Chromosome)/Kromosomo 1956 : No. 29 : 1020–24. [Japanese].
Chromosome morphology and meiosis in the above forms are described. The varieties of *S. montanum* referred to are vars. *anatolicum* and *dalmaticum*. Meiosis was mostly regular in all cases; a few minor abnormalities are mentioned.

2872 Bravo A., R.
Efectividad del lindano como agente inductor del poliploidismo en centeno.
(The efficacy of lindane as an agent for inducing polyploidy in rye).
Acta agron., Palmira 1956 : **6** : 143–47.
Germinated rye grains were placed in lindane solutions at concentrations of 0·1, 0·5, 1·0 and 1·5% for periods of 3, 6, 12 or 24 hours. Even at the lowest dosage, the formation of restitution nuclei occurred in 75% of observed root-tip cells and further divisions appeared to be inhibited, resulting in the death of the plants. No nuclear aberrations were observed in the leaves after spraying rye plants with lindane solution.

2873 Gluhih, K. A.
(Reaction of rye varieties to mutual interpollination).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 5 : 35–36. [Russian].
The results presented show that pollination of Vjatka 2 rye with other varieties caused an increase in vigour in the following generation but when the cross pollination was repeated two or more times the vigour was reduced and the plants became less winter hardy. Certain other varieties such as P–13 and Volžanka showed no such reduction and gave more vigorous and hardy plants after several cross pollinations. The difference in behaviour is explained by the fact that Vjatka 2 was produced by intercrossing several lines grown under different conditions whereas P–13 and Volžanka are homozygous varieties.

2874 Garina, K. P.
(Influence of different methods of pollinating winter rye on the percentage seed set and the viability of the offspring).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. biol. : 1956 : No. 4 : 58–66. [Russian].
In experiments in which the rye Vjatka Falenskaja was pollinated with 12 different pollen varieties the best seed set was obtained from pollen of Novozybovskaja M–4 in 1951 and from Taraščanskaja IV in 1952; only 1·4% and 0·93% sets were obtained respectively in the two years from inbreeding. Seed size, germinating capacity and vigour of the resulting seedlings also varied according to the pollinating variety used, as did the tillering capacity and winter hardiness of the young plants. In all combinations better results were obtained when

the pollination was effected without previous emasculation. When mixed pollen of two varieties was used the results were usually less successful in respect of set, 1000-grain weight, germination, tillering and winter hardiness, and pollen mixtures from three and more varieties were slightly less successful still.
Addition of pollen of *Festuca pratensis* to that of the pollinating parent increased the proportion of plants of the maternal type in the offspring. Pollination of very young florets with pollen of another rye variety and with pollen of *Phleum pratense* gave very low sets of 1·6% and 1·09% respectively; mature florets gave sets of up to 55·8% from rye pollen but only 25·8% from *Ph. pratense*. The highest sets were produced by fresh pollen and pollen kept for 4 and 8 hr. gave progressively lower sets.

2875 Borojević, S.
Razgranati klasovi raži (*Secale cereale* L.). [**Branched ears in rye (*S. cereale* L.)**].
Poljopr. Znanst. Smot. 1953 : **15** : 75–87.
The causes of the occurrence of plants with branched ears among some rye varieties in Zagreb in the 1949 and 1952 seasons*, which were characterized by abnormal meteorological conditions, were investigated. It is thought that this character is controlled genetically to some extent but can develop only under definite external conditions during the light phase.

MAIZE

2876 Stanton, W. R.
Estimation of yield in maize trials where a number of the plots have a very low stand count.
Mem. W. Afr. Maize Res. Unit, Ibadan 1956 : No. 5 : unpaginated. (Mimeographed).
It is suggested that, in cases where missing plot techniques cannot be applied to a defective maize stand, the theoretical yield could be estimated by multiplying the observed yield by the ratio theoretical stand/actual stand. The theoretical stand is the spacing less than which the variety gives no increased yield.

2877 Fleming, A. A., Rogers, T. H. & Bancroft, T. A.
Field plot technique with hybrid corn under Alabama conditions.
Agron. J. 1957 : **49** : 1–4.
A uniformity trial at Tallassee indicated that the optimum plot size is 2 rows of 10–15 hills. The use of the simple lattice design gave an increase in efficiency of no more than 1·5% compared with the randomized-block design.

2878 Stanton, W. R.
Notes on maize breeding procedure as applied to West Africa.
Mem. W. Afr. Maize Res. Unit, Ibadan 1956 : No. 4 : Pp. 4. (Mimeographed).
Information is given on the procedures adopted in the long-term breeding programme at the West African Maize Research Unit. The programme consists of three main stages: (1) testing and distribution of selected varieties, (2) selection within these varieties, followed by trial and distribution of the improved strains, and (3) hybridization to produce synthetics.

2879 Oberdorf, T.
Der heutige Stand der Maiszüchtung in der Deutschen Demokratischen Republik. (**The present position of maize breeding in the German Democratic Republic**).
Acta agron., Budapest 1956 : **6** : 33–38.
Current breeding aims include the production of small-grained types for cultivation between successive crops and the development of varieties with embryos from which oil may be extracted and of forms suitable for mechanical harvesting. A number of maize inbreds have been developed since 1951.

2880 Buchinger, A.
Gegenwärtiger (1955) Stand der Maiszüchtung in Österreich. [**The present (1955) position of maize breeding in Austria**].
Acta agron., Budapest 1956 : **6** : 121–27.
Current work is concerned with the multiplication of American inbred lines for the production of hybrids and with the development and testing of inbreds from local Austrian varieties.

2881 Scholz, J.
Entwicklung der Maiszüchtung in der Tschechoslowakischen Republik. (**The development of maize breeding in the Czechoslovakian Republic**).
Acta agron., Budapest 1956 : **6** : 39–48.
Descriptions are presented of 12 improved varieties used in Czechoslovakia and details are given of the yields of some intervarietal hybrids. Acclimatized inbred lines have been developed from material introduced in 1949 and these, as well as inbreds from local varieties, have yielded good single and double-cross hybrids. The

* Cf. Abst. 2972 in which branched ears in barley are reported to have occurred in 1950 and 1952.

production of synthetic varieties and selection for pollen sterility are now in progress.

2882 Spaldon, E.
Die Ergebnisse der Maiszüchtung in der Slowakei. (**The results of maize breeding in Slovakia**).
Acta agron., Budapest 1956 : **6** : 49–59.
Details are given of the characteristics and range of adaptation in Slovakia of nine improved varieties developed at state breeding stations. Work on the development of inbreds for the production of hybrids has been initiated.

2883 Ruebenbauer, T.
Der gegenwärtige Stand der Maiszüchtung in Polen. (**The present position of maize breeding in Poland**).
Acta agron., Budapest 1956 : **6** : 99–106.
The chief varieties developed by Polish breeders since 1925 are noted. Recent work on acclimatization has shown that while ordinary flint varieties attain 86% germination only at temperatures of 8–10° C. or higher, the acclimatized varieties Czerwony Koral [Red Coral] and Dar Północy [Midnight Gift] reach the same level at 6° C. Development and testing of inbred lines for hybrid production are now under way. Attention is also being given to breeding for resistance to *Ustilago maydis*.

2884 Jánossy, A.
Maisbau und Maiszüchtung in Ungarn. (**Maize cultivation and maize breeding in Hungary**).
Acta agron., Budapest 1956 : **6** : 13–22.
The history of maize breeding in Hungary is outlined and brief notes are provided on some registered Hungarian varieties and hybrids.

2885 Berzsenyi-Janosits, L.
Maiszüchtung durch Sortenheterosis in Ungarn. Methoden und Ergebnisse. (**Maize breeding by means of varietal heterosis in Hungary. Methods and results**).
Acta agron., Budapest 1956 : **6** : 149–58.
Since 1948 a number of intervarietal hybrids giving higher yields than standard varieties in tests carried out both in Hungary and other countries have been developed. The hybrids are normally intermediate in flowering time or as early as the earlier parent, but tend to resemble the later-ripening parent in time of ripening of the ear. Breeding is now directed towards the selection of strains with good combining ability which may be used in the production of either synthetic varieties or double-cross hybrids.

2886 Gyulavári, O.
Die Verbesserungsmöglichkeiten der Sortenheterosis beim Mais. (**The possibilities of improvement offered by intervarietal heterosis in maize**).
Acta agron., Budapest 1956 : **6** : 207–10.
The hybrid F-Mezőhegyes x Aranyözön [Golden Flood], developed at the Lovászpatona Plant Breeding Institute, Hungary, has given good yields in state trials. An attempt is being made to develop an improved type of Aranyözön by open pollination among local strains of the variety collected from different parts of the country.

2887 Pap, E.
Methoden und Ergebnisse der ungarischen Hybridmaiszüchtung. (**Methods and results of breeding hybrid maize in Hungary**).
Acta agron., Budapest 1956 : **6** : 221–35.
Several double-cross hybrids developed since 1950 at Martonvásár, mostly from yellow dent parents, have outyielded both open pollinated varieties and a number of American hybrids. Work on the production of early hybrids has been initiated. Current work is concerned with: (*a*) the establishment of suitable methods of testing for combining ability; (*b*) the development of improved procedures for comparative variety trials; (*c*) the introduction of monoploid breeding methods; (*d*) the production of single, double-cross and multiple hybrids of inbred lines; and (*e*) the introduction of pollen sterility into breeding lines.

2888 L'inaugurazione della nuova sede della Stazione Sperimentale di Maiscoltura. (**The inauguration of the new site of the Maize Experimental Station**).
Maydica, Bergamo 1957 : **2** : 4–24.
In addresses at the opening ceremony the director of the station and other speakers gave an outline of the work on maize breeding carried out by the station; figures were quoted showing that the use of hybrid maize added some six million centners of grain to the Italian maize crop in 1956 and that the expenses of the research constitute only 1·6% of the monetary value of this annual increase in production.

2889 Gluščenko, I. E.
(**The principal methods and the first results of maize breeding at the Institute of Genetics of the USSR Academy of Sciences**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. : 1956 : No. **3** : 31–49. [Russian].
The account of breeding at the Institute of

Genetics of the Academy of Sciences (IGAN) referred to in *PBA*, XXVI, Abst. 378 is extended to include some agrobiological observations and reports on recent trials of IGAN 1–5 in districts new to maize cultivation. All these corns and the new hybrids B272 and R6 proved productive.

2890 Mussijko, A. S. [Musiĭko, A. S.]
Die Methoden und Ergebnisse der Maiszüchtung im Institut für Genetik und Pflanzenzüchtung in Odessa. (**The methods and results of maize breeding at the Institute of Genetics and Plant Breeding in Odessa**).
Acta agron., Budapest 1956 : **6** : 159–68.
The development of the new variety Odessa 10 is described (cf. *PBA*, XXVI, Abst. 1263).

2891 Gluschtschenko, I. J. [Gluščenko, I. E.]
Die Grundsätze und ersten Ergebnisse der Maiszüchtung im Genetischen Institut der Akademie der Wissenschaften der UdSSR. (**The principles and initial results of maize breeding at the Institute of Genetics of the Academy of Sciences of the USSR**).
Acta agron., Budapest 1956 : **6** : 169–79.
By means of short-day treatment, late varieties were induced to flower and were crossed with early varieties. Five promising hybrids which have given increasing yields in three successive years have been obtained by this means. Work is now under way to develop inbred lines for the production of hybrids.

2892 Gluščenko, I. E. & Tovmasjan, O. V.
(**The principles and first results in maize breeding at the Institute of Genetics of the USSR Academy of Sciences**).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1956 : No. 23 : 47–59. [Russian].
The substance of this report is the same as that of the article summarized in Abst. 2889.

2893 Kirjakoff, K. P.
Die Maiszüchtung in Bulgarien und die Ergebnisse der Anwendung der Heterosiswirkung. (**Maize breeding in Bulgaria and the results of employing the effect of heterosis**).
Acta agron., Budapest 1956 : **6** : 107–15.
Tests of 700 hybrid combinations involving Bulgarian, Russian, Rumanian, Yugoslavian and Hungarian varieties have been carried out during 1950–55. The six best parents are described, together with the seven best hybrids, all the latter having yielded 20–30% more than standard varieties.

2894 Priadcencu, A.
Die Entwicklung der Maiszüchtung in der Rumänischen Volksrepublik. (**The development of maize breeding in the Rumanian People's Republic**).
Acta agron., Budapest 1956 : **6** : 61–97.
After a short account of maize breeding in Rumania since 1885, details are given of the pedigrees of ICAR–54, Portcaliu de Tîrgu Frumos [Tîrgu Frumos Orange], Lester Pfister and Arieş. The best hybrids developed are noted and full descriptions are given of the above varieties and of Banat, Romînesc de Arieş [Arieş Rumanian], Romînesc de Studină [Studină Rumanian], Rominesc de Dobrogea [Dobrogea Rumanian], Galben timpuriu [Early Yellow], Hîngu, Porumbul Romînesc timpuriu [Rumanian Early maize] and Cineantin.

2895 Mosneaga, V.
Heterosiszüchtung in der Rumänischen Volksrepublik. (**Heterosis breeding in the Rumanian People's Republic**).
Acta agron., Budapest 1956 : **6** : 189–206.
After an outline of the history of maize hybridization in Rumania since its initiation in 1930, descriptions of the first seven hybrids referred to in *PBA*, XXVI, Abst. 2295, are presented and details given of their yields in various localities. Mention is made of nine further hybrids which are undergoing trial.

2896 Tschin [Chin], S.-P.
Der Stand des Maisbaus und der Maiszüchtung in China. (**The position of maize cultivation and maize breeding in China**).
Acta agron., Budapest 1956 : **6** : 27–31.
By means of selection in Chinese land races, the three varieties Hua-nung 2 [Chinese Agriculture 2], Hsiao-li-hung [Small-grained Red] and Erh-chin-huang [Double Golden Yellow], which respectively yield 16%, 22% and 22% more than the unimproved races, have been developed. Fang-tsa 2 (Hsiao-li-hung x Chin-huang [Golden Empress]) and Lai-tsa 7 (Ta-li-hung [Large-grained Red] x Chin-huang) have outyielded local varieties by 41·63% and 30·2% respectively. Work on the production of hybrids from inbred lines is in progress.

2897 Eckhardt, R. C.
New hybrid corn Dixie 55 will be available for '57.
Miss. Fm. Res. 1956 : **19** : No. 10 : p. 1, 6.
A high yielding white hybrid which was tested

as Miss. 1123 has been released by the Agricultural Experiment Station, Stoneville, Miss. as Dixie 55. It produces two ears per stalk and shows good lodging resistance.

2898 Obregón, P.
Mejoramiento del maíz. (**Maize breeding**).
Agricultor venezol. 1956 : **20** : No. 187 : 17–19.

Work on maize breeding at the Central Office for Agronomic Investigations, Venezuela, includes: the maintenance of commercial varieties; conducting comparative trials of commercial, introduced and local varieties; the improvement of varieties by selection; and the production of yellow and white three-way hybrids. Data on yield of some of the last mentioned are provided.

2899 Dosado, V. G.
Performance and quality tests of glutinous strains of white flint corn.
Philipp. Agric. 1956 : **39** : 483–91.

A report is given of tests of the agronomic performance and quality of 14 open-pollinated varieties of the above type of maize in the dry and wet seasons during 1953–54 at the Central Experiment Station, Los Baños, Philippines.

2900 **Report of the Ninth FAO Hybrid Maize Meeting held in Cairo, Egypt, 1-6 October 1956.**
FAO UN, Rome 1956 : No. 1956/21 : Pp. 23. (Mimeographed).

Items discussed included general procedures to be used in the continued cooperative testing of hybrids, preservation of the germ plasm of open-pollinated varieties in European and Mediterranean countries, establishment of national maize committees, and the future coordination of work on hybrid maize in the European and Mediterranean regions. J. L. Blanco outlined work in Spain on the selection for sugar content in the stalks at grain maturity (cf. Abst. 1436).

2901 Montanari, V.
Il granturco può competere con la bietola? (**Can maize compete with beet ?**)
Agricoltura d. Venezie 1956 : **10** : 59–67.

Figures presented show that an average yield of 53·06 c. per ha. was obtained from hybrid maize in the Venetian provinces of northern Italy in 1955, thus exceeding the average maize yield for these provinces by 16·04 c. and the yield of open-pollinated varieties by 20·71 c.; in certain provinces the difference was as much as 28·57 c. per ha. The highest yields reported for the province of Treviso were 132·59 c. per ha. in the plains and 98·39 c. in the hills, both from Indiana 750A., the next most successful hybrids being Embro 155, U41 and Maygold 99A. With these yields the value of the maize crop per hectare is very nearly as great as that of sugar beet.

2902 Il record nazionale della produzione di mais ibrido battuto a Verona con q 144,38. (**The national record for yield of hybrid maize beaten at Verona with 144.38 q.**)
G. Agric. 1956 : **66** : p. 455.

The yield of 144·38 c. per ha. was obtained with Funk's G 77 and is the highest yet recorded in Italy from an area of over 200 m². The average yield of maize in the province of Brescia has increased from 28 to 38 c. per ha. with the introduction of hybrid maize.

2903 Bianchedi, A.
Possibili 200 q di granoturco per ha? (**Are 200 q. of maize per hectare possible ?**).
G. Agric. 1957 : **67** : p. 41.

Details are given of the improvement in production obtained in the province of Treviso by the use of hybrid maize in the years 1953–56 and its more widespread use is recommended. Yields of over 100 c. per ha. are reported and still higher ones are envisaged for the future.

2904 Jakuškin, J. V.
(**From the results of work on introducing maize growing in the non-chernozem zone**).
Dokl. seljskohozjaistv. Akad. Timirjazev. (Proc. Timirjazev agric. Acad.) 1956 : **23** : 90–107. [Russian].

In this general article on maize growing in the Soviet Union figures are given showing the increase in the area under hybrid maize since the decree directing it to be used was issued in 1947. In 1956 it was planned to sow all maize areas with hybrid seed obtained from intercrossing two varieties, where possible one flint and the other dent, a list being given of the four best varietal combinations. Seed-production plots are sown with one plant of the pollinating variety to three of the seed parent; several varieties are sometimes used as pollen parent so as to take advantage of mixed pollen. Yield increases of up to 7 c. per ha. are reported from such hybrids.

2905 Telkiev, G.
(**The use of hybrid maize seed**).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1956 : No. 3 : 11–12. [Bulgarian].

Some hybrids which show heterosis for yield on

irrigated land or under rainfed conditions in Bulgaria are mentioned.

2906 Mosneagă, V. *et al.*
Les perspectives d'augmentation de la production du maïs dans la République Populaire Roumaine, par l'emploi de semences hybrides. (**Prospects for increasing the production of maize in the Rumanian People's Republic by utilizing hybrid seed**).
Rev. Biol., București 1956 : **1** : 203–28.

The Rumanian version of this article was summarized in *PBA*, XXVI, Abst. 2295.

2907 Neve V., J. & Osler, R. D.
Maíz. Nueva promesa para el Noroeste. (**Maize, a new promise for the north west**).
Agric. téc. Méx. 1956–1957 : No. 3 : 16, 33.

Experiments are reported in which the hybrids Rocamex–501 and Rocamex–503 gave yields of 5400 and 5200 kg. of grain per ha. in the north-western zone of Mexico, which represents an increase of 41 and 46% respectively over the standard variety Llera III.

2908 York, J. O.
Arkansas hybrid corn performance tests, 1951-1955.
Rep. Ser. Ark. agric. Exp. Sta. 1956 : No. 60 : Pp. 13.

The results of trials carried out on maize hybrids at several stations in Arkansas are summarized.

2909 Hutchcroft, C. D. & Robinson, J. L.
The 1954 Iowa corn yield test.
Bull. Ia. agric. Exp. Sta. 1955 : No. P118 : Pp. 34.

Hutchcroft, C. D. & Robinson, J. L.
The 1955 Iowa corn yield test.
Ibid. 1956 : No. P120 : Pp. 24.

The results of trials of commercial hybrids of maize in different districts are summarized.

2910 Grogan, C. O. & Zuber, M. S.
A comparative study of top cross tester parents of maize.
Agron. J. 1957 : **49** : 68–72.

Four single crosses were compared with their two double hybrids as top-cross testers for measuring combining ability in segregates from a back cross and two single hybrids. Considerable variation was found between and within the single and double crosses as regards their efficiency in providing information on general and specific combining ability for yield. This variation depended largely upon the segregating population tested. In some cases, single crosses appeared to be as efficient as double crosses in estimating general combining ability. The six testers appeared to be equally effective in measuring combining ability for root and stalk lodging, and with one exception, ear height.

2911 Ballesteros, O. Q.
Relationship between yielding ability of single crosses and degree of genetic diversity of the inbred lines.
Philipp. Agric. 1956 : **39** : 185–91.

In investigations on crosses between introduced lines of white flint maize at the Central Experiment Station, Los Baños, Philippines, single crosses between inbreds of considerable genetic diversity usually gave higher yields than those between inbreds of the same parentage or of close origin. A positive and highly significant correlation was found between yield and ear length.

2912 Ščelokova, Z. I.
(**Utilization of selective fertilization in hybridization of maize**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. biol. : 1956 : No. 4 : 3–14. [Russian].

Two white-grained inbred lines when pollinated with self pollen mixed with pollen of various yellow-grained lines and hybrids gave from 57 to 88·2% of yellow grains; when the foreign pollen was applied 2 hr. after the self pollen the proportion increased in most combinations, the maximum being 96·3% of yellow grains. Similar results were obtained when two white-grained single-cross hybrids were pollinated with self pollen and pollen from various yellow-grained lines and hybrids, certain combinations giving up to 88·6% of yellow grains. On subjecting open-pollinated varieties to similar pollinations some, e.g. Kostyčevskaja, tended to select self pollen while others, e.g. Harjkovskaja Belaja Zubovidnaja [Harjkov White Dent], selected foreign pollen, giving up to 72·9% of yellow grains in certain combinations. It is concluded that by suitable choice of parents it should be possible to produce hybrids without detasseling. This proved to be the case with certain combinations: the hybrids Harjkovskaja Belaja Zubovidnaja x Harjkovskaja 23 and Harjkovskaja 23 x Harjkovskaja Kremnistaja [Harjkov Flint] gave grain yields of 36·8 c. and 31·9 c. per ha. respectively when produced without detasseling and 36·7 c. and 31·6 c. when produced by the ordinary method; these yields

were 2·9 c. per ha. above those of the respective maternal varieties. In respect of morphological characters 97·8% of the plants produced by the normal method were hybrids and in those produced by the simplified method 83·5%.
The hybrid Harjkovskaja 23 x Voronežskaja 76 yielded 30·8 c. per ha. when produced without detasseling and 31·6 c. when produced by the ordinary method.
The single-cross hybrid 26 x 27, with white grain, planted in alternate rows with hybrid 4 x 7 gave 98% yellow grains when it was detasseled and 60% when it was not; however, special observations of the progeny of the white grains in such crosses showed that many of them gave rise to hybrid plants, so the amount of hybridization was more than 60%.
In an experiment where a large number of varieties were sown together in groups, and the seed from detasseled plants was compared with that from plants that had not been detasseled, in some varieties the plants from the detasseled group gave slightly higher yields whilst in other varieties the reverse was true.
Some of the hybrids produced by pollinating the white-grained line 27 with self pollen and two hours later with pollen from the yellow-grained variety Harjkovskaja 23 bore brown grains, a character not present in either parent. In other cases partially floury grains appeared in crosses of flint x dent, dent grains in crosses of flint x flint and flint grains in crosses of dent x dent. In other hybrids characters from two pollen parents are reported: the white dent hybrid 26 x 27, pollinated with the yellow flint Voronežskaja 76 two hours after selfing, produced some hybrids with white flint grains; the white flint Kostyčevskaja, pollinated with the yellow dent line 2 two hours after selfing, gave some hybrids with white dent grains; and the white dent line 26, pollinated with the yellow flint Voronežskaja 76 two hours after selfing, gave some white flint hybrids.

2913 Anderson, A. H.
Breeding for high sugar in maize hybrids.
Proc. W. Va. Acad. Sci. 1955 : **27** : 11–13.
Differences have been found between double cross hybrids at Glanville State College, West Virginia, in respect of their stalk sugar content and it is suggested that these differences reflect differences in combining ability for sugar production. Hybrids carrying one C103 genome showed superior combining ability although those with two C103 genomes were not superior to those with one.

2914 Ito, K.
(On the results of repeated back crossing in breeding waxy maize).
Shikoku Nogyo Shikenjo Hokoku/Bull. Shikoku agric. Exp. Sta. 1955 : **2** : 10–22. [Japanese].
A maize breeding programme is described in which high-yielding white dent varieties were crossed with a low-yielding waxy yellow flint type from Manchuria and then back crossed to the white dent forms in the hope of obtaining high-yielding waxy types. Some improvement in yield was obtained by three back crosses but after the third back cross the yield was still 15–20% below that of the nonwaxy parents.

2915 Dimmock, F. & Donovan, L. S.
Influence of the maternal parent on the yield of flint x dent double-cross corn hybrids.
Canad. J. agric. Sci. 1956 : **36** : 326–28.
Five flint inbreds and three dent inbreds were combined in four double-cross hybrids and their reciprocals at the Canada Department of Agriculture, Ottawa, and the yield data from two years plantings are analysed statistically. No influence of seed parent on yield was found in 1951 but in 1952 an increase in yield in favour of dent seed parentage was found, although the degree of influence varied between the hybrids.

2916 Hoffman, W.
Die Grundlagen der Heterosiszüchtung zur Erzeugung "synthetischer Sorten". **(The fundamentals of heterosis breeding for the production of "synthetic varieties").**
Acta agron., Budapest 1956 : **6** : 181–88.
Methods of producing single-cross, double-cross and three-way cross hybrids and synthetic varieties are outlined. Although synthetic varieties do not show so marked a heterotic effect as double-cross hybrids, they are more readily produced and are regarded as a more satisfactory means of exploiting heterosis than the latter, not only in maize but also in other cross-breeding crops.

2917 Konzak, C. F.
The influence of oxygen on the mutagenic effects of X-rays on maize endosperm loci.
Radiation Res. 1957 : **6** : 1–10.
In a study of the influence of anoxia during X irradiation of the pollen on the induction of mutations of linked endosperm factors, it was found that the number of mutants in all classes (entire or partial loss of dominant phenotype in

endosperm tissue) was greater for a given dose in air or pure oxygen than in a nitrogen atmosphere, partial endosperm mutants being reduced in number relatively more in nitrogen than the entire endosperm mutants. On the assumption that the observed changes result from chromosome breakage, it was found that different regions of the chromosome were differently affected by the gas present during irradiation. The results are discussed in relation to hypotheses proposed to explain the oxygen effect.

2918 Kay, R. E. & Phinney, B. O.
The control of plastid pigment formation by a virescent gene, pale-yellow-1, of maize.
Plant Physiol. 1956 : **31** : 415–20.

The results of further investigations on the pale-yellow–1 mutant (cf. *PBA*, XXV, Abst. 3028) suggest that the single gene responsible for this form causes a block in the synthesis of protochlorophyll a and carotenols but does not exer any direct control over carotene synthesis.

2919 Kovarskiĭ, A. E.
(The mentor effect of pollen upon self pollinated maize).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 4 : 7–12. [Russian].

The development of uniform inbred lines within 1–2 generations and without the usual ill effects of inbreeding upon productiveness and vigour at Kišenev is described. Varieties were fertilized by self pollen + foreign pollen, e.g. of wheat, rye, pearl millet, sorghum, *Atriplex* or sunflower. The tabulated evidence shows that first-generation inbreds obtained by the use of a foreign-pollen mentor and second generation inbreds between I_1 lines whose parents had received different sorts of foreign pollen were more productive than the initial varieties. Crosses between (1) some of the first generation inbreds obtained by this method and (2) a cross between two third-generation inbreds developed in the ordinary way outyielded the double cross VIR 25 [Institute of Plant Industry 25]. I_1 Moldavanka Oranževaja [Moldavian Orange], in which sunflower had supplied the foreign pollen, x I_1 Sterling, also obtained by the use of sunflower pollen, was the most productive. (Cf. Abst. 2932).

2920 Korrelmais, 1957. **(Grain maize, 1957).**
Landbouwvoorlichting 14 : Bijl. 10; Ber. Rassenkeuze 1957 : No. 227 : unpaginated.

Short descriptions are given of 12 Netherlands and American varieties and hybrids tested on different types of soil in the Netherlands in 1956.

2921 Račinski, T.
(The white local maize from the Trojan district).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1956 : No. 6 : p. 17. [Bulgarian].

In recent trials at Vrabevo, Bjalata Mestna [White Local] has outyielded cultivated varieties such as Dnepropetrovsk and in dry seasons proved more productive than the hybrids Čirpan 96 x Maksimirski Konski Zub [Maksimir Dent] and A26 x Čirpan 96. On crossing with Zălta Dobrudžanska [Yellow Dobrogea] and other varieties it produced heterotic hybrids. Work on improving its earliness by selection of forms with two ears is mentioned.

2922 Borojević, S.
Citonegetska istraživanja deficija-duplikacija u translokacijama hromosoma 5 i 7 kod kukuruza. **(A cytogenetical study of deficiency-duplication in translocations involving chromosomes 5 and 7 in maize).**
Poljopr. Znanst. Smot. 1953 : **15** : 51–74.

The results of a cytogenetical study of the F_1 between T5–7a and T5–7c and the back cross of the hybrid to the two parents are reported. In the F_1 two loops were observed on chromosomes 5 and 7 respectively. In back crosses, plants with one or two loops were found. The translocation homozygotes in the back crosses were highly fertile. The percentage of pollen abortion in the F_1 and back-cross generations was higher than the percentage of ovule abortion and this is attributed to the transmission of duplications via the pollen.

2923 Tralau, H. W.
Polyploid series in maize.
Bot. Notiser 1957 : **110** : 126–29.

The author has studied plants with $2n = 10$, 11, 30 and 40. They were highly sterile, the monoploids being dwarfed, the triploids vigorous and the tetraploids inferior to diploids in height and development. The triploids gave rise mostly to diploids since aneuploid gametes were eliminated, but some trisomic and tetrasomic derivatives were obtained.

2924 Alexander, D. E.
The genetic induction of autotetraploidy : a proposal for its use in corn breeding.
Agron. J. 1957 : **49** : 40–43.

Maize homozygous for the gene *el* produces a

proportion of unreduced eggs. The author described a method of converting diploid inbreds into tetraploids by rendering them homozygous for *el* by back crossing and selfing, and then pollinating with autotetraploids; the technique is being applied at the Department of Botany, University of Illinois. The *el* + plants obtained from the initial cross of ++ inbred ♀ x *elel* ♂ are back-crossed with the recurrent parent as ♀. BC_1 plants are test-crossed with *elel* stock and the progeny pollinated by 4*n* maize. If a BC_1 plant is heterozygous for *el*, *elel* plants will constitute half of the test-cross progeny and these will produce both plump and shrivelled kernels in the same ear, when pollinated by a 4*n* ♂; such kernels are known to be tetraploid and triploid respectively. Subjected to the same test, ++ BC_1 plants give rise to plants bearing only triploid kernels. Back crossing is continued, using this test to identify the required *el*+ segregates. Finally, plants homozygous for *el*, produced by selfing heterozygotes in an advanced back cross, are pollinated by a previously-established tetraploid stock and the plump kernels harvested. It is pointed out that selfing of *elel* plants would not offer a satisfactory way of developing tetraploids since plants without a dominant allele at the locus in question produce a number of unreduced eggs; tetraploids with four *el* genes would therefore be unstable. It is suggested that synthetic tetraploid varieties may be developed from lines obtained by this method; it is not yet known however whether such varieties would be superior to diploid maize in yield and other characters. From an examination of the literature, it is concluded that aneuploidy may cause as much as 39% reduction in seed set in maize tetraploids.

2925 Morgan, D. T. (Jun.)
Asynapsis and plasmodial microsporocytes in maize following X-irradiation of the pollen.
J. Hered. 1956 : **47** : 269–74.

Each member of a pair of twin seedlings obtained after crossing plants of the inbred line CISA with X-irradiated pollen of the same line had asynaptic pollen mother cells which in most anthers formed large plasmodial masses. In anthers in which plasmodia were not formed, individual microsporocytes showing zygotene pairing were observed but at later stages of division numerous univalents were found. Root-tip cells had 19 chromosomes and occasionally an additional fragment. No traces of the fragment were seen at meiosis.

2926 Farkas, G.
Pflanzenphysiologische Fragen der Heterosiswirkung. (**Problems of plant physiology concerning the effect of heterosis**).
Acta agron., Budapest 1956 : **6** : 211–14.

Rates of mineral uptake were found to be characteristic for individual lines of maize, but, contrary to results obtained by other workers, hybrids did not show an increase in uptake. In two hybrid combinations studied, the inbred parents ceased to assimilate CO_2 during the midday and afternoon heat, while the hybrids continued to assimilate throughout the day; this difference between parents and hybrid was not observed in a third combination.

2927 Bunting, E. S. & Willey, L. A.
The emergence of maize from field sowings in Great Britain. I. The effect of date of sowing on the extent and speed of emergence of different varieties.
J. agric. Sci. 1957 : **48** : 447–56.

In trials at several centres, early flint varieties were superior in final emergence to late dent varieties while flint x dent hybrids occupied an intermediate position; in general, final emergence increased with later sowing dates. Open-pollinated varieties usually emerged more slowly than the flint x dent hybrids.

2928 van Eynatten, C. L. M.
Correlations between silking time tasselling time and maturity time under Ibadan conditions.
Mem. W. Afr. Maize Res. Unit, Ibadan 1956 : No. 11 : Pp. 5. (Mimeographed).

Regression coefficients between tasseling time, silking time and maturation date at Ibadan are worked out in order to assist in estimating expected maturation date when the course of normal development has been interrupted.

2929 Valeev, Š. V.
(Maize varieties from the Kazanj Breeding Station).
Agrobiologija (Agrobiology) 1956 : No. 4 : 40–45. [Russian].

Work on the development of productive varieties with short growth periods is reported. The best among them are Kazanj 108 and Kazanj 7, obtained by open pollination of White English and Sibirjačka [Siberian Dweller], respectively, by some early yellow dents. They outyield Pervenec Uluščennyĭ [Improved First-born] and Sibirjačka. Other early-ripening forms from Kazanj are more productive of grain and forage

than Voronež 76 and some midseaseon forage types such as Kazanj 1557 and Kazanskaja Vysokostebeljnaja [Kazanj Tall-stemmed] outyield Sterling and Odessa Gruševskaja.

2930 Dzjubenko, L. K.
[A comparative study of phenological phases in the first seed generation (F_1) of embryonic vegetative and sexual maize hybrids].
Bot. Ž. (Bot. J.), Kiïv 1955 : **12** : No. 3 : 29–43. [Ukrainian].

At the Ukrainian Institute of Botany the F_1 of Harjkovskaja Belaja Zubovidnaja [Harjkov White Dent] ♀ x late-ripening Adžametskaja ♂ had a longer growth period than the seed parent. The F_1 of embryo graft hybrids between the above varieties using Adžametskaja endosperm as stock was intermediate between Harjkovskaja Belaja Zubovidnaja and the sexual F_1 with regard to the length of the growth period. Growth periods of the F_1 of the graft hybrids also varied according to the method by which they were obtained; the progeny obtained by transplanting the whole embryo had a shorter growth period than when the radicle was removed and replaced by the corresponding part from Adžametskaja.

2931 Dijkhuis, F. J.
Computation of heat unit accumulations in maize for practical application.
Euphytica, Wageningen 1956 : **5** : 267–75.

Synchronization of flowering of several lines of maize has been achieved by sowing them at intervals indicated by the difference in their heat unit accumulations in the previous summer. The computation of heat unit accumulation is discussed.

2932 Kovarskiĭ, A. E. & Guljaeva, E. M.
[Improving vitality and changing inheritance by utilizing the influence of distantly related pollen when self pollinating as a new breeding method of cross-pollinating crop plants. (As demonstrated by work on maize and sunflower in 1953-54)].
Trud. Kišin. seljskohoz. Inst. (Rep. Kišin. agric. Inst.) 1956 : No. 22 : p.169. [Russian]. [From Ref. Ž. : Biol. (Abst. J. : Biol.) 1956 : No. 22 : Abst. 94837].

Pollination experiments at Kišinev on maize fertilized by pollen mixtures comprising 3/4 self pollen + 1/4 of pollen of wheat, rye, sorghum, African millet or sunflower, are described. It was found that the pollen of other species improved the grain set and that the F_1 was more productive and vigorous than material selfed in the normal way. No symptoms of depression were observed in material that had been selfed for two generations on pollination with mixed pollen in the third generation. The seed progenies of inbred maize lines obtained by this method showed morphological and biological changes, especially with regard to growth period, vigour, size, shape and colour of the ears, and grain colour and consistency. The shape, colour and size of the leaves also changed. It is concluded that in work with maize inbreds the pollen of other species is unavoidably introduced with the maize tassel inside the bag and it is thought that this accounts for the heterotic effects obtained. The bagging of such hermaphrodite plants as buckwheat, rye, beet and sunflower offers greater protection from the intrusion of the pollen of other species and this is thought to explain why no heterotic effects are observed in these plants. (Cf. Abst. 2919).

2933 Briggle, L. W.
Interaction of cytoplasm and genes in male-sterile corn crosses involving two inbred lines.
Agron. J. 1956 : **48** : 569–73.

The cross M1984 x M14 is incompletely male sterile whereas the reciprocal sheds a normal amount of viable pollen. Evidence was obtained suggesting that the incomplete male sterility of M1984 x M14 is the expression of a cytoplasmic factor derived from M1984, in conjunction with a dominant major gene from M14. This gene is pleiotropic, reducing the growth of the anthers and causing microspore abortion. Deviations from the ratios expected in the F_2 and backcross generations are attributed to modifiers. The degree of male sterility may also depend upon the effect of the environment upon the expression of the modifiers, the major gene and the cytoplasmic component.

2934 Curtis, J. J., Brunson, A. M., Hubbard, J. E. & Earle, F. R.
Effect of the pollen parent on oil content of the corn kernel.
Agron. J. 1956 : **48** : 551–55.

The four parental strains of maize used had yellow or white endosperm and represented a range in oil content of the grain from 11·45 to 1·12%. Pollen from two plants differing in endosperm colour and oil content was mixed and applied to the silks of one plant of each of the four strains, including the two individuals from

which the pollen was collected; in this way individual variation of the parental material was reduced as much as possible. Adjacent pairs of kernels with different ♂ parents, as indicated by endosperm colour, were analysed. Both the seed and pollen parent had a marked influence upon the weight and oil and protein content of the germ and endosperm, matroclinous effects, probably of a physiological nature, being detected. The effect of the seed parent upon the endosperm was not however more marked than upon the germ. The influence of the parents on endosperm weight was in some cases partly masked by heterosis. Slight metaxenia with reference to the oil content of the hull was noted.

2935 Blanco, J. L. & Blanco, M.
Maize hybrids with high sugar content in the stalks at grain maturity. Ninth FAO Hybrid Maize Meeting, Cairo, Egypt, 1-6 October 1956.
FAO UN, Rome 1956 : No. FAO/56/11/8537 : Pp. 10. (Mimeographed).

An account is given of selection of flint maize for high sugar content of the stalk juice, greenness of leaves and stalk stiffness after grain maturation, at the Misión Biológica de Galicia, Pontevedra, Spain. Effectiveness of selection for sugar content has been in inverse relationship to degree of inbreeding. In the 1955 trials, over 70% of the solids of the stalk juice of F_1 hybrids between selected inbreds consisted of sugars, the composition of which varied according to the inbred and hybrid. Hybrids with a high sugar concentration in the stalks have a high content of grain protein which is not however obtained at the expense of yield. According to the results from a test including three hybrids, the refractometer readings and percentage of stalk juice are maintained after harvesting of the grain.

2936 Whistler, R. L., Kramer, H. H. & Smith, R. D.
Effect of certain genetic factors on the sugars produced in corn kernels at different stages of development.
Arch. Biochem. Biophys. 1957 : **66** : 374–80.

Glucose, fructose and sucrose were found in maize kernels containing different combinations of *su*, su_2, *wx* and sh_2. Raffinose was present in *su* su_2 kernels. Sucrose content decreased with age from the time of 14 days after pollination in all genotypes except those involving sh_2. The amounts of fructose and sucrose decreased with age after 14 days in all genotypes. The gene sh_2 caused a marked increase in sucrose content at the age of 21–35 days.

2937 Ustinova, E. I.
(Some characteristics of the formation of the reproductive organs in maize inflorescences).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 864–67. [Russian].

A number of cases of branching of the ear and of the occurrence of female flowers in the male inflorescences are reported in the variety Voronež 76; they are taken as evidence in favour of the view that the original prototype of maize bore hermaphrodite flowers.

2938 Tavčar, A.
Nasljeđivanje duljine komušaka kod kukuruza zubana. **(The inheritance of the length of the husks in dent maize).**
Poljopr. Znanst. Smot. 1953 : **15** : 5–9.

At Zagreb the inheritance of the length of the husks was investigated in the F_1 from crosses between inbred lines as follows: long husk x short husk, short x normal, long x normal and normal x normal and also in the back crosses of the F_1 to both parents. Evidence showed that the length of the husk and the length of the ear are inherited independently and that the length of the ear is determined by polymeric genes.

2939 Daniel, L.
A kukorica 4 szemsorúságának öröklődésről. **(On the inheritance of the 4-rowed character in maize).**
Növénytermelés 1956 : **5** : 131–40.

The results of crosses between four-rowed strains on the one hand and eight strains with average row numbers ranging from 8 to 35·81 on the other indicated that the number of factors involved increased with increasing row number.

2940 Sós, J.
Die Ziele der Maiszüchtung von Gesichtspunkt der Medizin. **(The aims of maize breeding from the point of view of medicine).**
Acta agron., Budapest 1956 : **6** : 139–41.

In view of (*a*) the low tryptophane content of maize protein, (*b*) the presence of indoleacetic acid which decreases the availability of tryptophane, (*c*) the low content of niacin and (*d*) the occurrence of the antiniacin factor acetylpyridine, it is suggested that breeders should turn their attention to the improvement of the nutritional quality of maize.

2941 Rogina, B. & Horgas, D.
Doprinos poznavanju prehrambene vrijednosti kukuruza. (A contribution to the study of the nutritional value of maize).
Poljopr. Znanst. Smot. 1953 : **15** : 149–75.
The contents of water, protein, fat, reducing sugars, cellulose, thiamin, riboflavin, carotene, niacin and tryptophane in the grain of some yellow-grained and white-grained varieties, cultivated at Zagreb, were investigated.

2942 Bálint, A.
Die Probleme der Züchtung des Maises auf inneren Gehalt. (**Problems of breeding maize for chemical composition**).
Acta agron., Budapest 1956 : **6** : 243–47.
In experiments carried out at various stations in Hungary, both varietal and environmental differences in crude protein content of maize were found. The protein contents of hybrids were generally intermediate between those of the parents.

2943 Snijmais, 1957. (**Silage maize, 1957**).
Landbouwvoorlichting 14 : Bijl. 9; Ber. Rassenkeuze 1957 : No. 226 : unpaginated.
Data are provided on the yield, chemical composition of the leaves and stalks, stiffness of the straw and maturity period of several American introductions intended for cultivation for ensilage.

2944 Jackson, R. I.
Increasing corn production in Indonesia through planting of longer maturing varieties.
Philipp. Agric. 1954 : **38** : 1–12.
In variety trials in Java, a highly significant and positive correlation was obtained between grain yield and number of days to maturity.

2945 Galvez, N. L. *et al.*
The effect of different rates of nitrogen on the yield and chemical composition of corn.
Philipp. Agric. 1956 : **40** : 104–14.
Data are provided on the response of maize hybrids and varieties to different applications of nitrogenous fertilizers at two localities in Laguna province in the Philippines. Tables are given showing the average yields of shelled grain and stover and the nitrogen and phosphorus content of the grain and stover.

2946 Bálint, A.
Die theoretischen Grundlagen der Heterosis. (**The theoretical basis of heterosis**).
Acta agron., Budapest 1956 : **6** : 217–19.
A wide difference between the sexual cells of parental lines is regarded as the basis of heterosis. Of a number of different artificial fertilizer treatments given to the maize parents Mpf and F, one involving a high level of potassium resulted in an increase in the degree of heterosis shown by the cross. It has been shown that fertilizer treatment may affect the pH and isoelectric point of the pollen and stigmatic tissue and it is suggested that the change in heterosis may have been due to biochemical effects of this kind upon the reproductive cells.

2947 Le Roux, P. M. & Dickson, J. G.
Physiology, specialization, and genetics of *Puccinia sorghi* on corn and of *Puccinia purpurea* on sorghum.
Phytopathology 1957 : **47** : 101–07.
This paper is the first of a series on the genetics of specialization of *P. sorghi* and related species for which species of *Oxalis* are the secondary hosts.
Isolates of *P. sorghi* were obtained from Mexico, the USA and Canada and a preliminary survey indicated the presence of 15 races of which races 1, 7 and 10 are generally present in Mexico and throughout the central corn belt of the USA, while races 2, 4, 5, 6, 9 and 15 do not occur in Mexico. Race 3 was only found in an isolated area in New Mexico and races 11 and 12 in isolated valleys in Colorado and Wyoming. Races 8 and 14 were isolated from ecidiospores and have not been found in nature, nor has race 13 which was obtained from teliospores of *P. purpurea* on Sudan grass at Madison, Wis. So far the maize variety Cuzco has proved resistant to all isolates.

2948 Stanton, W. R. & Cammack, R. H.
Studies on *Puccinia polysora* in West Africa.
Robigo, Castelar 1956 : No. 2 : 19–20; also in Spanish, 20–21. (Mimeographed).
Two genes influencing the response of maize varieties to races of *P. polysora* from East Africa and West Africa have been identified by the West African Maize Research Unit, Ibadan, Nigeria. The first, provisionally called Rpp_2, confers resistance to race 1_{ea} and race 1_{wa} and occurs in a number of lines, from south-east Mexico, derived from the varieties San Luís

Potosí and Coahuilla 8. The second, Rpp_1, gives a hypersensitive reaction to race 1_{ea} and susceptibility to race 2_{ea}. Races 1_{ea} and 1_{wa} are similar but it is not yet certain that they are identical, nor is it clear whether races 2_{ea} and 2_{wa} are identical since maize lines containing Rpp_1 are giving anomalous results in West Africa.
A number of Trinidad lines show general resistance to the racially mixed infections which occur in the field.

2949 Nelson, R. R.
Resistance in corn to *Meloidogyne incognita*.
Phytopathology 1957 : **47** : 25–26. (Abst.).
Maize inbreds and single crosses have been tested for resistance to *M. incognita*. Some inbreds appeared to possess some resistance and others were tolerant of infection, while the single crosses were all at least as susceptible as the more susceptible of their inbred parents.

2950 Walter, E. V.
Corn earworm lethal factor in silks of sweet corn.
J. econ. Ent. 1957 : **50** : 105–06.
Dead larvae of *Heliothis armigera* have been found in the silks of a number of inbred maize lines and in some of the progeny from crosses between these lines and susceptible inbreds. The lethal inbreds include 221 selected from flour corn from New Mexico, 18–1 from Honey June x Mexican June, M119 from a sweet corn x Cuban Yellow Flint and other inbreds which include teosinte, a dent corn from Guatemala and the sweet corn inbred 18–1 in their ancestry.

2951 Sáringer, Gy.
Die Schädlinge des Maises in Ungarn und ihre Bekämpfung. (**The pests of maize in Hungary and their control**).
Acta agron., Budapest 1956 : **6** : 249–54.
Observations on varieties attacked by *Pyrausta nubilalis* showed that Bánkút Early Dent, F Early Dent and Pettend Golden Flood, with an average height of 230–250 cm., were 93–100% susceptible, while Bábolna Early, Diószeg Early Pearl and Székely, which are 160–190 cm. tall, showed only 23–24% infestation.

2952 **More resistance to corn earworm.**
What's New Crops Soils 1957 : **9** : No. 4 : p. 29.
A brief popular account is given of the problems involved in breeding maize and sweet corn strains with resistance to *Heliothis armigera*.

2953 Allen, T. C. (Jun.)
Symptoms of Golden Bantam corn inoculated with barley yellow-dwarf virus.
Phytopathology 1957 : **47** : p. 1. (Abst.).
After inoculation with strains 1, 9, 10, 11, 13 and 14 only those plants of Golden Bantam inoculated with strain 11 showed streaking between the veins and purple discoloration.

2954 Alexander, F. E. S. & Clifford, H. T.
Differential insecticide damage in maize varieties.
Nature, Lond. 1957 : **179** : p. 109.
Varieties tested at University College, Ibadan, Nigeria, differed in their response to treatment of the seed with a mixture of 3 parts by volume of ethylene dichloride and 1 part of carbon disulphide, differences in percentage of germination and seedling growth after storage being observed. Failure in germination and stunting of seedling growth were not necessarily associated.

BARLEY

2955 Schelling, P.
Improvement of the homogeneity of the barley variety Balder.
Euphytica, Wageningen 1956 : **5** : 281–88.
The selection Balder 50·4 has been developed at the Plant Breeding Station Centraal Bureau, Hoofddorp. It is more uniform than Balder, has slightly stiffer and shorter straw and matures a little earlier but is similar to Balder in respect of yield and malting quality.

2956 Moës, A.
La création d'une nouvelle race d'orge. (**The production of a new barley variety**).
Ann. Gembl. 1956 : **62** : 135–42.
A popular account of work in progress at the Gembloux Plant Breeding Station, Belgium, on breeding new varieties of winter and spring barley is presented and the techniques employed are outlined. The principal objectives are improved yield and grain quality, early maturity and resistance to frost, diseases, lodging and drought.

2957 Kiriyama, T. *et al.*
(**On the new naked-barley variety Shiranuihadaka**).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1956 : **3** : 429–44. [Japanese].
The variety Shiranuihodaka [Shiranui Naked] (= Norin 10 [Ministry of Agriculture and Forestry 10]) was selected from the progeny of

the cross Takeshita x Ichiwase. It is a midseason naked barley recommended for the island of Kyushu where it is superior to the commonly grown midseason barley Nigokumajima [Kumajima 2] in yield and grain quality.

2958 Poehlman, J. M.
B-400, a new, early variety of winter barley for Missouri.
Bull. Mo. agric. Exp. Sta. 1952 : No. 569 : Pp. 12.

This bulletin gives a more detailed description of a variety already described in *PBA*, XXIII, Abst. 1184. Its parentage is Kentucky 5 x Missouri Early Beardless.

2959 Leonard, W. H., Mann, H. O. & Powers, L.
Partitioning method of genetic analysis applied to plant-height inheritance in barley.
Tech. Bull. Colo. agric. Exp. Sta. 1957 : No. 60 : Pp. 24.

Data obtained at the Agricultural Experiment Station, Colorado, from the parents and F_1 and F_2 progeny of the cross Baitori 10 x Club Mariout have been used to illustrate the partitioning method of genetic analysis. Two gene pairs, *Uzuz* and *Uz2uz2*, were found to influence plant height, with complete dominance of greater height over lesser in each case and with the former pair having an effect 3·1 times that of the latter. Some interaction between the two gene pairs is likely.

2960 Leonard, W. H., Robertson, D. W. & Mann, H. O.
Complementary factors for height inheritance in barley.
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 229–40.

The genetics of height was studied in crosses involving all combinations of the three dwarf varieties Baitori 10, Katano and Brachytic 119. The first two varieties are Japanese semibrachytic barleys; the third is American. The experiments were carried out at the Colorado Agricultural Experiment Station. Height appeared to be determined by two complementary factors which are tentatively identified as *brUz* in Brachytic 119 and *Bruz* in the Japanese varieties.

2961 Takahashi, R. & Hayashi, J.
Genetic studies of barley crosses involving two brachytic genes.
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 250–58.

The genetics of height was studied in the crosses (Sakigake [First] x an Indian barley) x a brachytic American strain, (Wasehadaka [Early Naked] x Tammi) x the brachytic strain, Sekitorihen x the brachytic strain and the reciprocal, and Fuchin x a strain of genetic constitution *br uz*. The genetical distinction between the American brachytic gene *br* and the Japanese semibrachytic gene *uz* was confirmed. The effect of these genes on height appeared to be more or less additive.

2962 Woodward, R. W.
Linkages in barley.
Agron. J. 1957 : **49** : 28–32.

A summary is given of the linkage data obtained at the Utah Agricultural Experiment Station from over 1000 crosses studied during the past 26 years. Special attention has been given to genes situated in linkage group IV. Information is also given for groups I, II and V. The data obtained suggest the following order for four of the genes in group IV: *Gl – Z – K – Bl*, instead of the generally accepted order of *K – Z – Gl – Bl*. In group II, *Re2re2* for purple *vs.* white lemma and pericarp failed to show linkage with *Bb* for black *vs.* white lemma and pericarp; this result is in disagreement with earlier studies (cf. *PBA*, XXIII, Abst. 2678). The following gene pairs were found to be independently inherited: *Actact*, the albino condition at normal *vs.* low temperature: *Ghgh*, long *vs.* short glume hairs; *Gege*, glossy *vs.* normal spikes; *Rbrb* normal *vs.* ribbongrass condition; *Gsgs*, normal *vs.* glossy spikes and stems; *Uu*, normal number of culms *vs.* one culm; *Oo*, normal *vs.* orange lemma; *Opop*, normal *vs.* opposite spikelets; and *Gpgp*, normal *vs.* "grandpa" type.

2963 Cauderon, Y. & Cauderon, A.
Étude de l'hybride F_1 entre *Hordeum bulbosum* L. et *H. secalinum* Schreb.
(Study of the F_1 hybrid between *H. bulbosum* L. and *H. secalinum* Schreb.).
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1956 : **6** : 307–17.

Two viable seeds were obtained from 117 *H. bulbosum* ($2n = 28$) flowers pollinated with *H. secalinum* ($2n = 28$) pollen. One of the plants, with $2n = 28$ in the root tip of the germinating seed, grew very slowly in the initial stages but later became more normal. It resembled the *H. bulbosum* parent morphologically and in its growth rhythm but was considerably less vigorous. A series of chromosome counts during the growing period showed a progressive elimination of the *H. secalinum* chromosomes. Clones obtained by dividing could be divided into two

categories, those with $2n = 23$ to 30 and those with $2n = 14$; the latter are assumed to be, in effect, haploids of *H. bulbosum*. The second plant had initially $2n = 28$, with some sections with $2n = 29$; it was intermediate between the two parent species in its morphological characteristics but in the later stages of growth some of the *H. secalinum* chromosomes were eliminated. Both of the hybrids were sterile.

2964 Gotoh, K.
Genetic analysis of varietal differentiation in cereals. IV. Polygenic differences in agronomic characters between local strains of a barley variety, "Hakata No. 2".
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 172–75.

In the present number of this series (cf. Abst. 1790), a comparative study of five strains of the above variety from five widely separate localities in Japan is reported. Significant differences in culm length, ear length, number of spikelets and 100-grain weight were noted. Ear length and number of spikelets varied clinally.

2965 Enčev, Ja.
(Selection in breeding field crops).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 5 : 9–14. [Russian].

In these experiments carried out in Bulgaria, some hybrid populations of various generations from intervarietal crosses of two-rowed barley were subjected to selection and compared with the unselected parental varieties; they showed a superiority in yield varying from 14 to 104%; when they were compared however with the parental varieties after these had been subjected to the same selection process the superiority was not nearly so great and varied from 9% to 15%; in several combinations the hybrid selections yielded less than the selected parental forms.
In most crosses between two parents differing in time of maturity, earliness proved dominant and many F_2 families showed no segregation in this respect or in respect of yield.

2966 Marschall, W.
Beiträge zur Morphologie und Physiologie der Gerste. **(Contributions to the morphology and physiology of barley).**
Inst. PflBau u. -Zücht. landw. Hochsch. Hohenheim 1955 : Pp. 97.

This doctorial thesis is concerned primarily with a description of morphological and physiological differences between barleys of various provenance types in the collection maintained by the Institute for Plant Cultivation and Breeding of the Agricultural College at Hohenheim, Western Germany, and with determining the potential value of foreign varieties and provenance types for crossing with German varieties. After a brief survey of the systematics of *Hordeum vulgare*, the author lists the morphological and physiological characteristics of the principal German and foreign varieties in the Hohenheim collection, paying particular attention to their vegetative development and growth habit, extent of tillering, period to maturity and reaction to low temperatures during the juvenile stage. The collection is classified firstly according to growth habit in the juvenile stage and secondly according to maturity group. A positive correlation was established between prolonged heading period and high yields. Early-maturing varieties tended to produce fewer stalks and consequently lower yields than late-maturing varieties. In the third and concluding section of the thesis, varietal differences in protein content, resistance to lodging and resistance to *Puccinia simplex*, *Erysiphe graminis*, *Ustilago nuda* and *Helminthosporium gramineum* are noted.

2967 Oinuma, T.
(Caryomorphology of cereals. V. On caryotype variation in barley).
Shokubutsugaku Zasshi/Bot. Mag., 1952 : **65** : 236–44. [Japanese].

An English version of this paper forms part of the article summarized in *PBA*, XXIV, Abst. 2793.

2968 Oinuma, T.
(Caryomorphology of cereals. VI. The geographical distribution of barley caryotypes).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1953 : **66** : 28–33. [Japanese].

Cf. *PBA*, XXIV, Abst. 2793.

2969 Truhinova, A. T.
(Changes occurring in spring barley Pallidum 32 on autumn sowing).
Trud. Inst. Genet. (Trans. Inst. Genet). 1956 : No. 23 : 168–79. [Russian].

The substance of the article is the same as that of the report referred to in Abst. 1774.

2970 Woodward, R. W. & Rasmussen, D. C.
Hood and awn development in barley determined by two gene pairs.
Agron. J. 1957 : **49** : 92–94.

As previously reported, the hooded condition

was found to be controlled by two complementary genes, *K* and *Lk* (cf. *PBA*, XXVI, Abst. 1057 and XXVII, Abst. 1782). Plants homozygous for *k* and heterozygous or homozygous for *Lk* are long awned; short awns appear in plants homozygous for *lk*.

2971 Suneson, C. A. & Stevens, H.
An evaluation of smooth-awned and hooded Atlas barley.
Agron. J. 1957 : **49** : 50–52.

The smooth-awned and hooded characters were introduced into Atlas by back crossing at the Agricultural Experiment Station, Davis, Calif. The smooth-awned character was not associated with any increase in yield over the control, Atlas 46, in spring-grown tests carried out in the western states during 1953–55. In late-autumn sowings at Davis this character has however been associated with a beneficial effect upon yield in 5 out of 12 test years. Hooded Atlas gave markedly lower yields and kernel weights at Davis but equalled Atlas 46 in productivity at high-altitude stations in other western states.

2972 Kump, M.
Nasljedna pojava dvojnih klasova kod ozimog dvorednog golog ječma—*Hordeum distichum nudum*. (**The hereditary phenomenon of double ears in a two-rowed naked winter barley, *H. distichum* var. *nudum*).**
Poljopr. Znanst. Smot. 1953 : **15** : 11–25.

In 1950 and 1952*, lines of a barley which had been selected at Zagreb from two ears of an F_7 hybrid gave rise to some plants with two ears per culm. Both seasons were characterized by exceptionally dry and warm weather, conditions which also promoted the development of branched ears in barley, wheat and rye. In the normal season of 1951 no plants with branched ears occurred, but among the barley lines which developed double ears in 1950 some plants had a rudimentary second ear, besides the main ear. It is thought that double ears are a heritable character in barley, although to some extent this character can be modified by external conditions. Development of the double ear is thought to depend on different genetic factors from branched ears, although the development of both characters is promoted by the same environmental conditions.

2973 Caudwell, A.
Possibilités d'obtention d'orges à 6 rangs à gros grains latéraux, à partir de croisements d'orges *hexastichum* x *distichum*. (**Possibilities of producing six-rowed barleys with large lateral grains from crosses between *hexastichum* and *distichum* barleys).**
Ann. Inst. nat. Rech. agron., Paris : Sér. B : 1956 : **6** : 191–216.

Data are presented on grain yield and uniformity of kernel size, weight and number in F_2 and F_3 lines developed from crosses between two-rowed and six-rowed barleys. The two-rowed condition is determined by the single dominant gene, *V*, and the six-rowed condition by its recessive allele *v*. Both two-rowed and six-rowed segregates from the F_2 of crosses between these two forms varied considerably in size and number of lateral grains set and a study of the F_2 and F_3 generations led to the conclusion that a factor pair *Ww*, together with several minor additive genes, influenced these characters. In the dominant condition, *W* is responsible for small lateral kernels and for a low set of lateral kernels. Selection of large-grained six-rowed barleys with the genetical composition *vvww* from the F_2 and F_3 of crosses between six-rowed and two-rowed forms would appear to be a practical method of increasing yields, especially in the case of fodder barleys.

2974 Scholz, F.
Mutationsversuche an Kulturpflanzen. V. Die Vererbung zweier sich variabel manifestierender Übergangsmerkmale von bespelzter zu nackter Gerste bei röntgeninduzierten Mutanten. (**Mutation experiments on crop plants. V. The inheritance of two variably expressed intermediate characteristics between hulled and naked barley in X-ray induced mutants).**
Kulturpflanze, Berlin 1956 : No. 4 : 228–46.

Two mutants, selected from plants grown from X-irradiated seeds of the varieties Haisa and Donaria respectively, were found to be intermediate between the hulled parent varieties and the naked mutants of these varieties reported previously (cf. *PBA*, XXVI, Abst. 2333). Crosses of the seminaked mutants with hulled and naked forms indicated that a single recessive gene, designated *seminudoides* (*smn*) in the case of the Haisa mutant and *subnudoides* (*sbn*)

* Cf. Abst. 2875 in which branched ears in rye are reported to have occurred in 1949 and 1952.

in the Donaria mutant, is involved in each case. These two genes are inherited independently of each other and also segregate independently of the gene *n* for nakedness. The gene pair *nn* is completely epistatic to *smn smn* and incompletely epistatic to *sbn sbn*. The genes *smn* and *sbn* do not appear to have a pleiotropic effect or to be linked with any gene conferring unfavourable characteristics; the mutant lines did not differ either morphologically or as regards yield potential from the parent varieties. Preliminary studies of the Gatersleben World Collection of barleys suggest that the two genes for seminakedness may occur naturally in other forms.

2975 **Quality evaluation of barley varieties and selections grown in 1954 and 1955 and Annual Reports 1954-55 and 1955-56.**
Publ. Malt. Res. Inst., Madison 1956 : No. 13 : Pp. 16.

The results of pilot-scale malting and brewing tests carried out by the Malt Research Institute and Barley and Malt Laboratory, Madison, Wis., and nine commercial laboratories are summarized. Among the six-rowed spring barleys, the recently released varieties Traill (cf. *PBA*, XXVI, Abst. 3307) and Parkland (cf. *PBA*, XXVI, Abst. 2326) received promising reports and the new selections UM570 [(Newal x Peatland) x Montcalm] and Minnesota I–48–5 (selection of Brandon 1136) were considered worthy of continued tests.

2976 Nežincev, I. P.
(More attention to breeding varieties of malting barley).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 5 : 33–35. [Russian].

Many of the high-yielding varieties widely cultivated in the Soviet Union are low in malting quality while the variety with the best quality, Loosdorf Hanna, is defective in standing capacity. Barley breeders are urged to give more attention to the removal of these defects and to breeding two-rowed malting barleys with regular well-filled grains.

2977 Udvaros, K.
Télálló ősziárpa nemesítése. **(Breeding hardy winter barley).**
Agrártudomány 1955 : **7** : p. 482.

A selection method which obviates both dependence upon hard winters and the necessity for expensive freezing equipment in breeding winter-hardy barley is described. The barley is sown in spring and the plants which show the most marked tendency to remain in the vegetative state are considered to require the greatest amount of cold for normal development and are therefore regarded as the most winter hardy.

2978 Kaufmann, M. L.
The improvement of lodging resistance in Kindred barley by use of the backcross method of breeding.
Diss. Abstr. 1956 : **16** : Publ. No. 16,178 : p. 843.

Use was made of the back-cross technique in an attempt to combine the malting quality of Kindred with lodging resistance. Lodging resistance was maintained for three back-cross generations; the malting quality of some lines approached that of Kindred and the average yield of selected second and third back-cross lines exceeded that of Kindred or the six nonrecurrent parents. Lodging resistance was significantly correlated with high kernel weight and with yielding capacity. The mildew resistance of two of the donor parents was maintained up to the BC_3 in some lines. It is suggested that more than one donor parent should be used in a back-crossing programme of this type, since the derivatives of one donor parent were superior in lodging resistance while those of another were superior in malting quality. Continued backcrossing of lodging-resistant lines may be expected to result in the desired combination of characters.

2979 Moseman, J. G.
Evaluation of varieties and selections of barley for disease resistance and winter hardiness in southeastern United States.
Tech. Bull. NC agric. Exp. Sta. 1956 : No. 1152 : Pp. 33.

This bulletin provides a concise summary of data obtained during four years of trials carried out in North Carolina with 372 varieties from the United States world collection of barley varieties in respect of resistance to *Erysiphe graminis* var. *hordei*, resistance to *Puccinia hordei*, winter hardiness and other characters.

2980 Hänsel, H. & Zakovsky, J.
Mildew-resistant barley mutants induced by X-rays.
Euphytica, Wageningen 1956 : **5** : 347–52.

Among the mutant progeny of X-irradiated Vollkorn [Round-grain] barley, one was found, at the Plant Breeding Station, Probstdorf, Austria, to be resistant to *Erysiphe graminis* races A_1, B, C, D and F and others moderately resistant to races A and B. Some correlation was found between mildew resistance and lodging

resistance and it is suggested that this may result either from a pleiotropic effect of the induced mutation or from weakening of infected stems.

2981 **Atlas 54 barley released.**
What's New Crops Soils 1957 : **9** : No. 5 : p. 24.

This variety is described as being superior in respect of yield and other characters to other strains of Atlas and possessing resistance to scald and *Erysiphe graminis* similar to that of Atlas 46. It was developed by the California Agricultural Experiment Station but no details of its origin are given.

2982 Nover, I. & Mansfeld, R.
Resistenzeigenschaften im Gersten- und Weizensortiment Gatersleben. 2. Prüfung von Wintergersten auf ihr Verhalten gegen *Erysiphe graminis* DC. f. sp. *hordei* Marchal. (**Resistance characteristics in the Gatersleben barley and wheat collection. 2. Testing winter barleys for their reaction to *E. graminis* DC f. sp. *hordei* Marchal**).
Kulturpflanze, Berlin 1956 : No. 4 : 341–49.

Tabulated data are presented on the reactions of 225 varieties, lines and land races of different provenance when tested in the greenhouse for resistance to seven physiological races of *E. graminis* f. *hordei* (cf. *PBA*, XXVI, Abst. 2337). Approximately 3% of the varieties, all pertaining to convar. *hexastichon* var. *hybernum*, proved resistant to all races and another 3%, consisting of six provenance types of convar. *hexastichon* var. *hybernum* and one of convar. *hexastichon* var. *densum*, were resistant to the majority of races. Some varieties that had shown themselves resistant in the greenhouse in the juvenile stage later proved susceptible in the adult plant stage when grown in the field. Most of the highly resistant forms originated from the Balkans and lacked winter hardiness; some were also highly susceptible to *Puccinia* spp. Lines and provenance types in the Gatersleben collection that show promise as breeding material for future crosses are noted.

2983 Hirata, K.
(**The types of colonial development of mildew mycelium on susceptible and resistant barley varieties**).
Nihon Shokubutsubyorigaku Kai Ho/ Ann. phytopath. Soc. Japan 1955 : **20** : 73–76. [Japanese].

On susceptible varieties, the mycelium of *Erysiphe graminis* forms regular rectangular or oval patches and produces abundant conidia after 6 days. On resistant varieties, the mycelial patches are less regular in outline and the conidia are produced after a shorter interval but in considerably less quantities.

2984 Haskett, W. C.
Development of barley scab and varietal resistance.
Phytopathology 1957 : **47** : p. 15. (Abst.).

Differences have been found between isolates of *Gibberella zeae* in their pathogenicity to barley. Chevron CI 1111 and Peatland CI 5267 showed the greatest resistance to *G. zeae* and hybrids including Chevron in their parentage showed an intermediate reaction.

2985 Fadrhons, J.
Nová odrůda jarního ječmene. (**A new variety of spring barley**).
Za socialist. Zeměd. 1957 : No. 6 : 360–64.

A description is given of Semčický Hospodářský [Semčice Agricultural] (Dobrovický Staročeský [Old Czech Dobrovice] x Danský Maja [Danish Maja]) from Semčice. It is more productive of grain and shows a higher degree of resistance to *Ustilago* and lodging than the standard varieties in the montane and potato-growing districts and ripens a day earlier than varieties such as Valtice. Its malting properties are quite good.

2986 Schmidt, J.
Nové odrůdy ječmene do výroby. (**New barley varieties for production**).
Za vysokou Úrodu 1957 : **5** : 107–11.

Descriptions are given of Semčický Hospodářský [Semčice Agricultural] (cf. Abst. 2985) and Čelechovický Hanacký [Čelechovice Haná] (Haisa x [Štarnovský Kneifl x Nolcův A]). The latter was bred at Čelechovice, Moravia, and has been made a standard in some districts of the province of Olomouc, where it outyields all other varieties. It is early, resistant to *Ustilago* and lodging, and has large grain with good malting properties.

2987 **New Missouri winter barley.**
What's New Crops Soils 1957 : **9** : No. 5 : p. 23.

Mo. B–475 (Admire x Missouri Early Beardless Selection) has been released by the Missouri Agricultural Experiment Station. It gives higher yields than Mo. B–400, shows greater winter hardiness and has better threshing qualities. It is resistant to *Ustilago nuda* and some races of *U. nigra*.

2988 Andrews, J. E.
Inheritance of reaction to loose smut, *Ustilago nuda*, and to stem rust, *Puccinia graminis tritici*, in barley.
Canad. J. agric. Sci. 1956 : **36** : 356–70.

The inheritance of reaction to races Vr and Vs of *U. nuda* has been investigated, at Lethbridge, Alberta, in crosses between Anoidium, resistant to both races, Montcalm, susceptible to both races and Valentine (Chevron x Trebi) resistant to race Vr but susceptible to race Vs. Data from F_1, F_2, F_3 and back-cross progenies indicate that the resistance of Valentine to race Vr is controlled by a single dominant gene and the resistance of Anoidium by a single recessive gene, designated *un7*. The two genes were found to be independent. Data from two crosses and one back cross indicated that the resistance of Anoidium to race Vs is controlled by a single dominant gene.

In crosses with the resistant variety Valentine mature plant reaction to race 56 of *P. graminis* var. *tritici* and seedling reaction to race 15B were shown to be controlled by a single gene with resistance dominant. This gene was linked with the gene for resistance to race Vr of *U. nuda* with a recombination value of $9{\cdot}2 \pm 1{\cdot}8\%$.

2989 Green, G. J. & Dickson, J. G.
Pathological histology and varietal reactions in *Septoria* leaf blotch of barley.
Phytopathology 1957 : **47** : 73–79.

Lists are given of a total of 195 varieties of *Hordeum vulgare* and *H. distichum* under the headings of resistant, susceptible and indeterminate in respect of their reaction to *S. passerinii*. All varieties of the Manchurian type were found to be susceptible, while most of the 53 resistant varieties were of the Coast or North African type, or had North African type ancestors, the most resistant varieties being Feebar. No isolates of *S. passerinii* from *H. jubatum* were found to be pathogenic to cultivated barley varieties, nor could *H. jubatum* be infected by isolates from *H. distichum* or *H. vulgare*.

2990 Sisler, W. W. & Timian, R. G.
Inheritance of the barley stripe mosaic resistance of Modjo (C.I. 3212) and C.I. 3212-1.
Plant Dis. Reptr. 1956 : **40** : 1106–08.

Modjo and CI3212–1 are known to be resistant to all the strains of the above virus with which they have been tested. F_2 progenies of crosses of these varieties with susceptible barleys were inoculated with the California "E" isolate. Resistance proved to be recessive and to depend upon two pairs of genes, which were independent of *Bb* (black *vs.* white kernel), *Kk* (hooded *vs.* awned condition), *Nn* (hulled *vs.* naked caryopsis) and *Ss* for length of rachilla hairs.

2991 Machacek, J. E. & Wallace, H. A. H.
A study of the germination of barley seed treated to control loose smut.
Canad. J. Pl. Sci. 1957 : **37** : 59–68.

Varietal differences in susceptibility to various seed treatments have been found, OAC21 being less susceptible than Olli and Montcalm.

MILLETS AND SORGHUMS

2992 Holienka, J.
Biologie kvetení čumízy. (**Biology of flowering in *Setaria italica* L.**).
Sborn. čsl. Acad. zeměd. Věd: Řada rostlinná Výroba 1956 : **29** : 1093–100.

Tabulated information relating to the floral biology of some varieties at Odessa, together with data on the effect of self and open pollination upon grain set and 1000-grain weight is presented. All varieties had a higher 1000-grain weight when selfed than when open pollinated.

2993 Argikar, G. P. & Salanki, M. S.
Possibilities of developing types of bajra resistant to downy mildew.
Poona agric. Coll. Mag. 1956 : **47** : 81–82.

Nearly all the selections of *Pennisetum typhoides* grown at the Agricultural Research Station, Bijapur, Bombay, remained free from infection by *Sclerospora graminicola*.

2994 **A Shallu developed for combining.**
What's New Crops Soils 1957 : **9** : No. **4** : p. 23.

A dwarf, early-maturing selection from Shallu has been released by the Texas Agricultural Experiment Station under the name of Combine Shallu. It has an open head which threshes easily and the seed keeps well, although it germinates slowly. It has high disease resistance and produces high quality grain for livestock and poultry feeding.

2995 Hadley, H. H.
An analysis of variation in height in sorghum.
Agron. J. 1957 : **49** : 144–47.

A statistical analysis of variation in height in sorghum in the cross Double Dwarf White Sooner milo x Durra PI 54484 was made at the Texas Agricultural Experiment Station using the method described by Mather. As previously reported by other workers (cf. *PBA*, XXIV, Abst. 2984) at least four independent genes with

unequal effects influence the expression of plant height.

2996 **New Texas sorghum.**
What's New Crops Soils 1957 : **9** : No. 5 : p. 23.

A grain sorghum variety adapted to combine havesting has been developed by the Texas Agricultural Experiment Station and released under the name Combine Hegari. Of uniform growth, strong stalked and high yielding, the new variety is recommended for livestock feeding but not for starch manufacture.

2997 Veyret, Y.
Note sur les chromosomes de quelques espèces cultivées du genre *Sorghum*. (**Note on the chromosomes of some cultivated species of the genus *Sorghum*).**
Agron. trop., Nogent 1956 : **11** : 756–58.

The chromosomes of *S. elegans*, *S. exsertum*, *S. gambicum*, *S. mellitum* and *S. membranaceum* were compared. All these species were found to have $2n = 20$ and the close similarity observed in the morphology of their chromosomes suggests that they are closely related. Each species has two pairs of relatively large chromosomes with a double constriction, the other, smaller, chromosomes having a single median constriction.

2998 Kidd, H. J.
The morphology of the panicle in the cultivated sorghums.
Diss. Abstr. 1956 : **16** : Publ. No. 17,189 : p. 1568.

A survey has been made of the morphological features of the panicle of cultivated and weed sorghums. The modifications which the panicle of cultivated sorghum has undergone were elucidated. The three broad groups distinguished were closely in accordance with those proposed by previous investigators.

2999 Sieglinger, J. B.
An aid in observing yellow endosperm in sorghum grain.
Agron. J. 1957 : **49** : p. 58.

By running the seeds of breeding material through a hand-operated pearler, grains with yellow endosperm can be readily distinguished.

3000 Doggett, H.
The breeding of sorghum in east Africa. I. Weevil resistance in sorghum grains.
Exp. J. exp. Agric. 1957 : **25** : No. 97 : 1–9.

A study of local and introduced varieties at the Ukiriguru Experimental Station, Tanganyika, suggested that a low amount of damage due to weevil (*Calandra oryzae*) during storage is associated with a thick corneous outer layer of the endosperm and with small size of the grain. Selection for weevil resistance in the field by biting the ripe grains in order to choose heads bearing grains with a thick corneous layer, regardless of grain size, was effective.

RICE

3001 Abraham, T. P., Misra, R. K. & Ghose, R. L. M.
Observations on progeny row trials with rice crop.
Indian J. Genet. 1956 : **16** : 47–51.

"On the basis of experimental results obtained at the Central Rice Research Institute [Cuttack], it has been found that the number of replications for estimation of genetic variability in progeny row trials with progenies from natural populations need not be more than about six.

"The correlation between progeny yields and number of ear-bearing tillers per plant has been found to vary from about 0·5 to 0·8.

"Plant height at flowering time was found to be highly correlated with yield.

"A multiple regression equation for estimating progeny yield on the basis of number of earheads and height at flowering has been worked out and the multiple correlation coefficient has been found to be about 0·7.

"Discriminant function formulae based on number of earheads and plant height in addition to or alternate to observed yield have been worked out and were found not more efficient than selection based on yield only in the varieties studied." [Authors' summary].

3002 Sologubov, L. M. & Svinarev, V. I.
(Rice cultivation and the prospects for its progress in the province of Astrahanj).
Zemledelie (Agriculture) 1956 : No. 10 : 62–65. [Russian].

Mention is made of two new high-yielding standards: VROS3716 and DIHROA213.

3003 Parthasarathy, N.
The rice institute at Cuttack.
Indian Fmg. 1956 : **6** : No. 8 : 17–19.

The work of the Central Rice Research Institute, at Cuttack, is briefly reviewed; among the topics mentioned are the *indica* x *japonica* hybridization programme, fundamental genetical studies and the testing of strains and varieties for disease resistance.

3004 Solomon, S. S. & Shendge, Y.
Rice problems are varied in Bombay State.
Indian Fmg. 1956 : **6** : No. 8 : 65–68.
Progress made since 1919 at several research stations in Bombay State is reviewed, reference being made to breeding for earliness, quality, salt tolerance and resistance to diseases, pests and lodging.

3005 Bhavanishankar Rao, M. & Sahadevan, P. C.
In Madras rice research has been on since 1913.
Indian Fmg. 1956 : **6** : No. 8 : 81–84.
Brief reference is made to progress achieved and work at present in hand in rice breeding at various centres in Madras State.

3006 Mirchandani, H. C.
How to step up rice production in Uttar Pradesh.
Indian Fmg. 1956 : **6** : No. 8 : 85–86.
A number of improved varieties have been developed for use in Uttar Pradesh since 1924 by means of selection, acclimatization and hybridization. Selection from *indica* x *japonica* progenies and breeding for drought resistance are in progress at rice research stations in various parts of the state.

3007 Solomon, S. & Shendge, P. Y.
Rice research in Bombay State.
Poona agric. Coll. Mag. 1956 : **47** : 110–22.
The article consists mainly of a survey of past and current breeding at 15 stations.

3008 Koshiray, M. A. *ET AL.*
A summary report on rice improvement in Egypt in 1955.
News Lett. FAO Internat. Rice Comm. 1956 : No. 20 : 16–22.
The report includes an account of breeding and variety testing. Some new strains, notably Miniature B (US3 x YM2), outyielded YM47, which is itself a highly productive variety with a yield of 5·44 tons per ha. in 1955. YM47 is however deficient in response to fertilizer. Many of the varieties tested showed an appreciable response to ammonium sulphate. In a trial of drought-resistant upland varieties under conditions of occasional irrigation, some Philippine introductions gave a good performance but were late in heading. Philippine 64, the variety giving the highest yield, was therefore crossed with the early variety YM47. It was estimated that under the conditions of the trial the amount of irrigation water used was reduced to 36% of that normally required for growing lowland rice. Progress is being made in developing a variety with long, fine grains. In trials of new varieties and crosses on reclaimed land near the coast, Agami Mont. 1 maintained its position as a variety highly tolerant of salinity. A late variety for cultivation in the Nile valley is being sought so that water may be saved during the period of water shortage by broadcasting as late as possible or by sowing in nursery beds at the usual time and delaying transplantation.

3009 **Annual Report of the West African Rice Research Station 1954** (1956) : Pp. 24.
Selection of various local and introduced rices continued at the above station, Rokupr, Sierra Leone. Selection of the local varieties Kema and Lath, resistant to total submergence, was initiated. Differences in salt tolerance were noted among strains of BG79, an early rice from British Guiana. The F_3 of DC39/15 x Yenti 38, Ngasein 57 x Tai Chu, Toma 112 x Ngasein 57 and India 46 x Kav.12 was mass selected.

3010 **Notes on current investigations (research) April to June, 1956.**
Malay. agric. J. 1956 : **39** : 220–27.
Rice. Segregation still continues in *indica* x *japonica* hybrids although yields show considerable improvement. In trials at Krian, Perak, a new selection, Mayang Sa Batil 19, has significantly outyielded all others, giving an increase of 20% over the standard MSB8. The results of other trials still in progress are given.
Oil palm. In their first year of bearing, dumpy and dumpy-tall back-cross palms are giving similar oil yields. At the Highlands Estate dumpy back-cross palms are 10% larger in girth than F_2 tall x dumpy progeny.
Rambutan. Fruits of clones R4, R81 and R86 retained their flavour best and had the most satisfactory appearance in deep-freezing trials.

3011 Oka, H.
(Restriction of gene combination in hybrid populations of rice. Phylogenetic differentiation of cultivated rice. XIII).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 185–91. [Japanese].
Two mechanisms restricting gene combination in segregating rice populations are discussed. The first, resulting from linkage between two independent loci and gamete-development genes of the same set, is described in Abst. 1242. The second involves restriction of recombination through low rate of propagation of the recombinants compared with the rates for the parental types.

3012 Morinaga, T. & Kuriyama, H.
Cytogenetical studies on *Oryza sativa* L. VIII. The F_1 hybrid of *O. sativa* L. and *O. cubensis* Ekman.
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 133–41.
A description is given of F_1 hybrids obtained by crossing four varieties of *O. sativa* with *O. cubensis*. The F_1 progenies tended to be heterogeneous in respect of anthocyanin pigmentation; anther length in the hybrids was intermediate between the values for the parents. Meiosis in the hybrids was regular and fertility quite good.

3013 Katayama, Y. & Shida, S.
On the occurrence of yellow seedlings in a variegated strain of rice.
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 131–36.
Further to the investigations reported in *PBA*, XXV, Abst. 2018, the authors have ascertained that the yellow seedling character that they described is only expressed under comparatively unfavourable temperatures. At 30° C., the seedlings remain green.

3014 Yamaguchi, H.
(On the effects of X rays on rice seedlings from seed of diverse provenance).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 91–95. [Japanese].
The damage caused to seedlings by 13,000 r. of X rays varied with the provenance of the seed. Some induced chlorophyll mutations are described.

3015 **(New varieties of rice, 1956. II).**
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : p. 116. [Japanese].
The list of varieties referred to in Abst. 566 is supplemented by the following newly released forms. Yamakogane [Mountain Wealth] (= Norin 99 [Ministry of Agriculture and Forestry 99]), from Kinki 34 x Kinki 33, is a midearly rice with grains of superior flavour; it is recommended for soils of low fertility. Koshihikari (= Norin 100), from Norin 22 x Norin 1, is an early variety of good quality; it germinates well at low temperatures. Fukuminori [Double Crop] (= Norin 101), from Kyokusen x Tosan 38, is a high-yielding awned rice.

3016 **(New varieties of upland rice, 1956).**
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : p. 116. [Japanese].
The variety Iwatehatamochi (= Norin 35 [Ministry of Agriculture and Forestry 35] glutinous rice) has been released. It is midlate and resistant to diseases and pests. Its parentage is Tosan 36 glutinous rice x Norin 15.

3017 Koyama, T. *et al.*
(On the new rice variety Kiyosumi).
Kantotosan Nogyo Shikenjo Kenkyu Hokoku/J. Kanto-Tosan agric. Exp. Sta. 1955 : No. 8 : 1–13. [Japanese].
A full description is given of the above variety (cf. *PBA*, XXVI, Abst. 2388).

3018 Dave, B. B.
Per-acre yields in Madhya Pradesh can certainly be raised.
Indian Fmg. 1956 : **6** : No. 8 : 75–78.
A list of recommended rice strains, which have been developed in Madhya Pradesh, is included in this article.

3019 Ishikawa, E., Kondo, H. & Ikenaga, N.
(Variation in the ecological characteristics of rice varieties associated with changes in sowing date).
Shikoku Nogyo Shikenjo Hokoku/Bull. Shikoku agric. exp. Sta. 1955 : **2** : 1–9. [Japanese].
The behaviour of a series of 51 Japanese varieties sown on various dates between 15 April and 14 August was investigated. The principal characteristics studied were vegetative period, stem height and panicle weight. The varieties could be divided into two groups: those in which the vegetative period was little curtailed by short days and those in which it was considerably shortened.

3020 Syakudo [Shakudo], K. & Kobori, O.
(Studies on quantitative inheritance. XIV. A. Rice. (d) Studies on the inheritance and quantitative function of the genes determining heading period. (3) On the quantitative effect of the genes E_a and E_b and on the scale).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 69–75. [Japanese].
The influence of the above two genes on heading period and culm length was studied in crosses involving the varieties Dairyu [Large-grained], Nabeshima and Rojin [Old Man]. Both genes have a quantitative influence on heading period and culm length; both are incompletely dominant. The effect of the genes became approximately additive if the arc-tangent

transformation was used (cf. *PBA*, XXV, Abst. 3082).

3021 Buenaventura, M. R.
Dormancy periods of promising rice varieties.
Philipp. Agric. 1956 : **39** : 558–70.
Investigations carried out at the University of the Philippines on the dormancy period of 52 upland and lowland rice varieties showed that the length of dormancy may vary from almost zero to 11 weeks. About one third of the varieties tested had a dormancy period of five weeks and most varieties showed a gradually rising rate of seedling emergence with time; this appeared to be independent of the length of the dormancy period.

3022 Gangulee, H. C.
Hot water emasculation of rice.
Sci. & Cult. 1956 : **21** : 739–41.
Use of the hot-water method of emasculation at the Department of Botany, Presidency College, Calcutta, is described. Flowers were emasculated by placing the panicles for 10 minutes in water having an initial temperature of 44–45°C. In this way, 80% seed setting was secured. Very young stamens were not affected by the treatment.

3023 Cho, J.
Double fertilization in *Oryza sativa* L. and development of the endosperm with special reference to the aleuron layer.
Nogyo Gijutsu Kenkyusho Hokoku/Bull. Nat. Inst. agric. Sci. : Ser. D. : 1956 : No. 6 : 61–101.
An amplified account of the researches referred to in *PBA*, XXVI, Abst. 2409 is given.

3024 Enomoto, N., Yamada, I. & Hozumi, K.
(Artificial germination of rice pollen. IV. The temperature limits for the germination of the pollen of rice varieties).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1956 : **25** : p. 69. [Japanese].
Upper and lower limits for the germination of the pollen of a series of Japanese and introduced varieties are given. The highest upper limits were found in varieties with an intermediate vegetative period; the highest minimum limits occurred in early varieties. The introduced varieties had a lower minimum limit than the Japanese varieties.

3025 Amemiya, A., Akemine, H. & Toriyama, K.
(Cultural conditions and growth of the young rice embryo. Studies on rice embryo culture. I).
Nogyo Gijutsu Kenkyusho Hokoku/Bull. Nat. Inst. agric. Sci. : Ser. D. : 1956 : No. 6 : 1–40. [Japanese].
Experiments on the optimum conditions for rice embryo culture are described. Special attention is given to the effect of nutrients, growth substances, pH and temperature.

3026 Amemiya, A., Akemine, H. & Toriyama, K.
(The stage at which rice embryo culture becomes possible and varietal differences in growth response. Studies on rice embryo culture. II.).
Nogyo Gijutsu Kenkyusho Hokoku/Bull. Nat. Inst. agric. Sci. : Ser. D. : 1956 : No. 6 : 41–60. [Japanese].
Varieties differ in the age at which the embryo can be grown in artificial culture; the earliest case encountered was the variety Rikuu 132 in which the embryos can be cultured when only five days old. Varietal differences in the growth rates of embryos in artificial culture were noted but no differential response to particular nutrients was observed.

3027 Portères, R.
Taxonomie agrobotanique des riz cultivés *O. sativa* Linné et *O. glaberrima* Steudel. Première partie. Le riz asiatique cultivé, *O. sativa* L. I. Evolution historique de nos conceptions taxonomiques sur l'espèce *Oryza sativa* Linné. **(Agrobotanical taxonomy of the cultivated rices *O. sativa* Linné and *O. glaberrima* Steudel. First part. The Asiatic cultivated rice, *O. sativa* L. I. Historical development of our taxonomic conceptions of the species *O. sativa* Linné).**
J. Agric. trop. Bot. appl. 1956 : **3** : 341–84.
The cultivated forms of *O. sativa* are discussed with reference to: (*a*) the systematic position of this species within the genus *Oryza*, (*b*) the history of cultivated rice and views put forward by different authors, both before and after Linnaeus, on the taxonomic classification of the different varieties and forms; (*c*) certain regroupings and subdivisions proposed by the present author within the species; and (*d*) the probable ancestry of the species. It is suggested

that several species, the most important of which were *O. breviligulata* and *O. fatua*, have contributed to the genetical patrimony of *O. sativa*; the contribution made by *O. perennis* is more doubtful but the author does not deny the possibility of its having played a minor role.

3028 Portères, R.
Taxonomie agrobotanique des riz cultivés *O. sativa* Linné et *O. glaberrima* Steudel (suite). II. Des affinités naturelles entre formes cultivées compagnes appartenant à *O. sativa* L. [**Agrobotanical taxonomy of the cultivated rices *O. sativa* Linné and *O. glaberrima* Steudel (continued). II. Natural affinities between associated cultivated forms pertaining to *O. sativa* L.**].
J. Agric. trop. Bot. appl. 1956 : **3** : 541–80.

After discussing the wide range and variability of biotypes and botanical forms growing together in the rice fields of West Africa, the author applies a new system of taxonomic classification, based in particular on the colour of the glume, to the more important forms found. The impact of recent introductions of rice from outside West Africa upon the composition of rice populations is also mentioned. (Cf. Abst. 3027).

3029 Paul, A. K.
Bengal farmer has his fair share of rice problems.
Indian Fmg. 1956 : **6** : No. 8 : 87–92.

Breeding and selection for lodging resistance under varying climatic conditions is in progress in Bengal.

3030 Pushpanaden, P.
Ascorbic acid and helminthosporiose of *Oryza sativa* L.
Curr. Sci. 1957 : **26** : p. 26.

Co.20 and T141, resistant to *Cochliobolus miyabeanus* (*Helminthosporium oryzae*), had a lower content of ascorbic acid than the susceptible varieties PTB10 and T1145.

3031 Goto, K. & Fukatsu, R.
(**Studies on *Aphelencoides oryzae*. III. Analysis of varietal resistance and the nature of resistance**).
Nogyo Gijutsu Kenkyusho Hokoku/Bull. Nat. Inst. agric. Sci. 1956 : No. 6 : 123–49. [Japanese].

Extensive data are provided on the resistance of rice varieties to the above pest in central Japan and on the behaviour of resistant and susceptible varieties when infected with the nematodes under laboratory conditions. The most resistant variety noted was Tosan 38.

3032 Ishikura, H. & Watanabe, Y.
(**On varietal differences in the resistance of rice to *Chilo simplex***).
Shikoku Nogyo Shikenjo Hokoku/Bull. Shikoku agric. Exp. Sta. 1955 : **2** : 138–46. [Japanese].

A collection of Japanese varieties was tested for incidence of the above pest in 1949–50. The most resistant varieties were Sembonasahi, Kidama and Ihara 5. A correlation was noted between resistance and prolific tillering.

3033 Katayama, Y. & Shida, S.
(**A comparative study of the chlorophylls and carotenoids of rice varieties by means of paper chromatography**).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 107–10. [Japanese].

The contents of chlorophylls a and b, two xanthophylls and carotene in the leaves of a series of mainly Japanese varieties were estimated by a paper-chromatographic technique.

FORAGE GRASSES

3034 Jacquard, P.
Espèces et souches de graminées. (**Species and strains of Gramineae**).
Bull. tech. Ing. Serv. agric. 1956 : 793–99.

Breeding work on *Lolium perenne*, *Festuca elatior*, *F. pratensis*, *Dactylis glomerata*, *Phleum pratense*, *Bromus inermis* and *Avena elatior* at the Central Station of Plant Breeding and Genetics, Versailles, is reviewed and, on the basis of yield, earliness and resistance to cold, drought and diseases, recommendations are made as to the best strains of these grasses for cultivation in France.

3035 Ravantti, S.
Timotei- ja puna-apilakontojen siemensadoista. (**Seed yield of timothy and red-clover varieties**).
Koetoim. ja Käytäntö 1955 : **12** : p. 27.

Data are given of variety trials carried out at Tammisto in 1950–54 which demonstrate the superiority in seed yield of native Finnish timothy varieties, in particular the variety Tammisto. Similar trials with red-clover varieties indicate better seed yields from foreign strains, but there are indications that, in spite of this, the Finnish variety Tammisto is better adapted to Finnish conditions.

3036 Tätigkeitsbericht für das Jahr 1956. **(Report of activity for the year 1956).** Mitt. ArbGemeinsch. Förderung Futterbaues 1956 : No. 51 : Pp. 44.

Notes on varietal differences in central and western Switzerland in the yield and dry matter and protein contents of lucerne, red clover and Ladino clover, both in pure stands and in mixed sowings, are included.

Caputa, J. Die Frostschäden in Kunst- und Naturwiesen der Westschweiz im Jahre 1956. (Frost damage in artificial and natural meadows in western Switzerland in the year 1956). (pp. 30–35).

Of the lucerne varieties under observation, Altfränkische Luzerne [Old Franconian lucerne], Harmigniés, Keyseri and Atlantic proved the most winter hardy. The Norwegian variety Molstad was the most frost resistant of the red-clover varieties and the Swedish variety Sena the most winter hardy of the varieties of meadow fescue tested.

3037 Pohjakallio, O. & Salonen, A. Orientoitumisvaiheen tulokset muddusniemen koetilan nurmikasvitutkimuksissa. **(Results of the orientating phase of investigations on herbage plants at the Muddusniemi trial ground).** Maataloust. Aikakausk. 1956 : **28** : 1–17.

This paper deals with fungal infection during overwintering and other aspects of herbage plant cultivation and includes some comparative data on yields, hardiness and longevity of various strains of grasses and clovers.

3038 Elsukov, M. P. **(An experiment on changing the heritable basis of some annual forage plants).** Selekcija i Semenovodstvo (Breeding and Seed-growing 1956 : No. 4 : 36–44. [Russian].

This report on acclimatization work with herbaceous forage plants at the Williams Forage Institute mentions a spring form of ryegrass which acquired the winter habit and describes a new *Setaria italica* variety, Severnaja [Northern], adapted to cultivation in the province of Moscow. The latter was obtained from the Ukrainian variety Dnepropetrovsk 15, grown for several generations at the institute.

3039 Stebbins, G. L. **Cytogenetics and evolution of the grass family.** Amer. J. Bot. 1956 : **43** : 890–905.

It is suggested that early in the history of the grasses the major groups became separated, partly as a result of adaptation to different climatic zones and partly by the establishment of differences in anatomy and in the structure of the reproductive parts. Later reduction and simplification of the inflorescence occurred, marked by parallel trends in several different evolutionary lines. Many lines developed, in addition, highly specialized fruits, modified to assist in dispersal. These major trends were accompanied by a series of cycles of divergent and convergent evolution, the latter being brought about by hybridization and chromosome doubling. The role of polyploidy in the evolution of the grasses is discussed with reference to *Aegilops* (cf. *PBA*, XXVI, Abst. 2206), *Dactylis* and *Bromus*.

3040 Ono, H. & Tateoka, T. **Karyotaxonomy in *Poaceae* · I. Chromosomes and taxonomic relations in some Japanese grasses.** Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1953 : **66** : 18–27.

Notes on the chromosome number and in many cases the chromosome morphology of species pertaining to the following genera are presented: *Agropyron, Brachypodium, Bromus, Festuca, Trisetum, Eragrostis, Eleusine, Sporobolus, Stipa, Muehlenbergia, Agrostis, Calamagrostis, Polypogon, Alopecurus, Digitaria, Setaria, Sacciolepis, Paspalum, Pennisetum, Cymbopogon, Eccoilopus, Microstegium* and *Hemarthria* (cf. Abst. 1225).

3041 Kneebone, W. R. & Heller, V. G. **Leaf and crude protein percentages among strains of some forage grasses.** Tech. Bull. Okla. agric. Exp. Sta. 1956 : No. T65 : Pp. 23.

The following material was subjected to protein analysis: selected clones of smooth brome grass (*Bromus inermis*) and their polycross progenies; strains of sand lovegrass (*Eragrostis trichodes*) and blue grama (*Bouteloua gracilis*); strains and selected clones of sideoats grama (*B. curtipendula*); and selected clones of sand bluestem (*Andropogon hallii*) and their open-pollinated progenies. The selections, progenies and strains differed significantly in protein percentage within each species, with the exception of sideoats grama. In smooth bromegrass, significant differences in percentage of dry matter were detected between the selections and between their progenies at the same stage of maturity. In the case of the last-mentioned species and sand bluestem, the leaves and stems were

analysed separately, significant differences being found between the selections and between their progenies with respect to the protein percentage of the leaves or stems. The leaves had a much higher protein percentage than the stems. Differences were found among clones and progenies of sand bluestem in the rate of decrease in protein percentage between October and January; the clones and lines of smooth bromegrass showed differences in this respect with the advance of maturity. Parent-progeny correlations for protein percentage of the leaves were low in both these species. In the more detailed chemical analysis of plants of sand bluestem, protein percentage proved to be significantly correlated with P and Ca percentages but not with height, diameter and yield of green weight; the protein, Ca and P contents of the leaves were correlated with those of the stems. The bearing of these results upon breeding is discussed.

3042 Lackamp, J. W.
The breeding of grasses for leys on dry soils.
Euphytica, Wageningen 1956 : **5** : 254–58.

Indigenous and foreign species of forage grass are being tested at the CIV Plant Breeding Station, Ottersum, with a view to breeding for resistance to drought. Species of *Festuca, Bromus, Dactylis, Poa, Agropyron, Alopecurus* and *Phalaris* are the most promising.

3043 Aleksandrov, V. Ja.
(Cytophysiological analysis of the heat resistance of plant cells and some problems of cytoecology).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 939–61. [Russian].

Data are given showing the rate at which protoplasmic streaming ceases with rise in temperature in a number of different species, from which it is concluded that the damage caused by heat results from denaturization of the cell proteins. This process is however reversible, can be influenced by hardening and differs in different botanical and geographical groups. Thus a five-minute exposure of the cells of the leaf-sheath epidermis caused the interruption of protoplasmic streaming at temperatures ranging from 42·4° to 45·7° C. in members of the Pooideae and at temperatures varying from 47·6° to 48·2° C. in members of the Panicoideae. Members of the genera *Aeluropus* and *Aristida* examined resembled the Panicoideae in their behaviour and this is regarded as further evidence for classing them there rather than with the Pooideae.

3044 Holton, C. S. & Siang, W. N.
Fusion between primary sporidia derived from different species of *Tilletia* occurring on wheat and certain grass hosts.
Res. Stud. St. Coll. Wash. 1956 : **24** : 326–30.

Sporidial fusions have been observed between the species of *Tilletia* causing dwarf bunt of wheat and *T. guyotiana, T. fusca* and *T. caries*, some differences in degree of compatibility being indicated by the percentage of mated pairs and their subsequent development. No fusions were observed in the case of *T. holci, T. cerebrini, T. asperifolia* or *T. elymi*.

3045 Duran, R. & Fischer, G. W.
Further studies on the synonymy and host range of the dwarf bunt fungus, *Tilletia contraversa*.
Res. Stud. St. Coll. Wash. 1956 : **24** : 259–66.

Evidence is presented that *T. pancicii*, found on *Hordeum* spp., *T. calospora*, found on *Alopecurus*, and *T. hordei* are probably identical with *T. controversa*. New hosts of *T. controversa* include species of *Aegilops, Agropyron, Alopecurus, Bromus, Elymus, Hordeum* and *Lolium*, the fungus found having been variously misidentified as *T. caries, T. tritici, T. guyotiana, T. lolii, T. bornmuelleri, T. calospora, T. hordei, T. pancicii* and *T. brevifaciens*.

3046 Nygren, A. & Åkerberg, E.
Studies in species and hybrid derivatives of *Poa* new to practical work.
Ann. Acad. reg. Sci. upsal. 1957 : No. 1 : 53–69.

Details are given of the performance, at seven localities in Sweden, of strains of *P. ampla, P. pratensis, P. longifolia* and *P. compressa* and of three different crosses between *P. ampla* and *P. pratensis* and between *P. ampla* and *P. alpigena*. The hybrids gave promising results, all progeny from the crosses between *P. ampla* and *P. pratensis* giving higher yields of dry matter than *P. pratensis* var. Skandia II, although their aftermath was less satisfactory. The reciprocal cross *P. pratensis* x *P. ampla* has not yet been obtained. Other successful crosses made include *P. ampla* x *P. compressa, P. compressa* x *P. pratensis* and *P. longifolia* x *P. hybrida*, all progeny from the latter cross so far examined having $2n = 28$.

3047 REBISCHUNG, J.
Hérédité de trois caractères chez le dactyle, *Dactylis glomerata* L. (**The inheritance of three characters in cocksfoot, *D. glomerata* L.**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1956 : **6** : 281–306.

The inheritance of chlorophyll deficiency, sheath hairs and the presence of long hairs at the base of the blade was studied in the I_1 to I_4 of inbred lines of *D. glomerata* obtained by selfing or sib mating. Chlorophyll deficiency was shown to be determined by two independently-inherited recessive genes. Either of these two genes in a recessive condition gives rise to plants with yellowish leaves; if both genes are recessive the plant is usually nonviable. The presence and extent of hairs on the sheath is governed by three recessive genes, the effects of which are cumulative. Long hair at the base of the blade is also controlled by three recessive genes. Indications were obtained that one or more of the genes controlling this latter character are linked with the genes governing hairiness of the sheath. The results obtained in these experiments confirm that *D. glomerata* is an autotetraploid (cf. *PBA*, XXIV, Abst. 2061).

3048 BORRILL, M.
A morphologically distinct ecotype of *Dactylis glomerata* L.
Nature, Lond. 1957 : **179** : 544–45.

In investigations at the Welsh Plant Breeding Station, Aberystwyth, *D. glomerata* ssp. *hispanica* and var. *maritima* have been found to differ in epidermal type. Of the 151 tetraploid and 11 diploid populations so far examined, 8 tetraploid populations belong to the epidermal type of var. *maritima* and the remainder to the ssp. *hispanica* type. Taxonomically var. *maritima* should be regarded as an ecotype of ssp. *hispanica*; genetical and distributional studies may however establish it as a distinct subspecies.

3049 BARNETT, F. L.
Cytogenetics of interspecific hybrids in the Bromopsis section of *Bromus*. I. Diploid and tetraploid hybrids.
Agron. J. 1957 : **49** : 77–82.

Investigations were carried out on interspecific hybrids between the diploid species *B. anomalus*, *B. grandis* and *B. laevipes* ($2n = 14$) and between the tetraploids *B. ciliatus*, *B. frondosus* and *B. richardsonii* ($2n = 28$). In general, the hybrids were morphologically intermediate but dominance and heterosis were expressed in some cases. Reciprocal F_1 hybrids between *B. ciliatus* and *B. frondosus* segregated into dwarf, semi-dwarf and normal types. The mean frequency of bivalents ranged from 6·50 to 6·79 per cell at metaphase I in F_1 hybrids between the diploids, and from 12·33 to 12·81 in F_1 *B. ciliatus* x *B. frondosus*, which was the only 4*n* hybrid studied meiotically. Univalents and multivalents were of moderately common occurrence in the 4*n* hybrid. The diploid hybrids were highly sterile but slightly fertile when used as ♀ parents in back crosses. When open-pollinated, the tetraploid hybrid also showed a very low degree of fertility. The cytological data suggest that the chromosome complements of the three diploid species were derived from a single basic genome (L) and that the chromosomes of *B. grandis* are slightly more homologous with those of *B. laevipes* than with those of *B. anomalus*. The multivalents observed in *B. ciliatus* x *B. frondosus* were probably indicative of homology between the parental genomes.

3050 BARNETT, F. L.
Cytogenetics of interspecific hybrids in the Bromopsis section of *Bromus*. II. Triploid hybrids and their amphiploid derivatives.
Agron. J. 1957 : **49** : 83–88.

A total of 12 F_1 triploids was obtained from the following crosses: *B. anomalus* ($2n = 14$) x *B. ciliatus* ($2n = 28$), *B. anomalus* x *B. frondosus* ($2n = 28$), *B. ciliatus* ($2n = 28$) x *B. anomalus*, *B. ciliatus* x *B. grandis* ($2n = 14$), *B. frondosus* x *B. orcuttianus* ($2n = 14$) and *B. richardsonii* ($2n = 28$) x *B. grandis*. In general, the hybrids were more vigorous than their parents and were intermediate in morphological characters. At metaphase I, the mean frequencies of univalents ranged from 6·66 to 9·63 per cell while bivalents occurred with frequencies varying from 4·78 to 5·48; 0–4 trivalents were observed in individual cells. The frequencies of irregularities at anaphase I and of micronuclei at the quartet stage were high. All the F_1 hybrids were highly sterile. Colchicine-induced amphidiploids obtained from *B. anomalus* x *B. ciliatus*, *B. frondosus* x *B. orcuttianus* and *B. richardsonii* x *B. grandis* had mean bivalent frequencies ranging from 18·93 to 20·10; univalents and multivalents were of moderately common occurrence. The amphidiploid of *B. frondosus* x *B. orcuttianus* was highly sterile. *B. richardsonii* x *B. grandis* had a seed set of over 30% and appeared to be cytologically stable; its open-pollinated progeny provided no evidence of genetic segregation and yielded a seed set of over 40%. Since this amphidiploid exceeds its parents in vigour, it merits investigation of its agronomic value.

3051 HUGHES, R.
The herbage production of two strains of perennial ryegrass.
Bull. Welsh Pl. Breed. Sta. : Ser. H : 1956 : No. 18 : Pp. 78.

The report is given of a comparison between Aberystwyth S24 and Irish in respect of production and field behaviour when grown in mixtures with clovers and Italian ryegrass, under both hay and grazing management and at two levels of fertilizer treatment at the Brynamlwg farm of the Welsh Plant Breeding Station.

3052 LAZENBY, A.
The problem of assessing strains. A study in grass-breeding technique.
J. agric. Sci. 1957 : **48** : 294–304.

A study was made of the herbage production of the perennial ryegrass strains Devon Eaver, Irish, S24 and New Zealand and the short-rotation ryegrass H1, when grown under three different conditions of spacing and two types of management at the Welsh Plant Breeding Station, Aberystwyth. In general, individual-cut yields showed similar trends to those of the total yields. The greatest differences between the yields of the four perennial strains were obtained in the single-plant plots and the least in the broadcast plots. In both the single-plant and broadcast plots, H1 was superior in production to the other strains. Interactions between strain and sowing method were significant in 1953 but not in 1952. The relative yields of the strains under similar conditions of spacing were almost identical under both managements.

3053 CRUICKSHANK, I. A. M.
Crown rust of ryegrass.
NZ J. Sci. Tech. 1957 : **38** : 539–43.

With the exception of one strain of Dutch origin (A1749), perennial-ryegrass strains were highly susceptible in glasshouse tests to an inoculum of *Puccinia coronata* var. *lolii* derived from collections in 34 districts in New Zealand. Short-rotation strains selected from perennial x Italian ryegrass crosses with respect to field resistance to crown rust and other features were highly resistant. Italian-ryegrass and perennial x short-rotation strains showed an intermediate reaction.

3054 MANNER, R.
Hammenhögs Runa rödsvingel. (**The Hammenhög red fescue Runa**).
Våren 1957. Hammenhögs, Otto J. Olson & Sons AB : 10–11.

Developed from wild material, the lawn grass Runa [Rune] forms a dense turf, is late in producing flowering shoots and grows more slowly after being cut than other red fescue strains.

3055 BUCKNER, R. C.
Breeding in tall fescue for palatability.
Diss. Abstr. 1956 : **16** : Publ. No. 15,919 : p. 848.

In selection of *Festuca arundinacea* for palatability on the basis of data on preferential grazing, greater progress was made with inbreds than by maternal-line selection of open-pollinated material. Palatability was associated with low fibre content and high moisture content. Some well-grazed inbred lines had a high content of protein; it may therefore be possible to develop synthetics improved in both palatability and nutritional value.

3056 HAYMAN, D. L.
Cytological evidence for apomixis in Australian *Paspalum dilatatum*.
J. Aust. Inst. agric. Sci. 1956 : **22** : 292–93.

Australian specimens possessed a chromosome number of $2n = 50$. At metaphase I most of the pollen-mother cells had 10_I and 20_{II}. Although the anthers contained about 60% of stainable pollen, the constancy of the chromosome number and behaviour in plants from different areas suggest that reproduction is apomictic. It is postulated that the Australian type has the genome formula AABBC. It may be possible to synthesize this form by hybridization between other types and thus obtain sexual plants for use in breeding.

3057 Kanariezaad, 1957. (**Canary grass, 1957**).
Landbouwvoorlichting 14 : Bijl. 4 : Ber. Rassenkeuze 1957 : No. 221 : unpaginated.

Brief data on period to maturity, yield of straw, leaves and seed, length and stiffness of straw and size of seed are presented for two varieties grown in the Netherlands, Spaans [Spanish] and Fries [Frisian].

3058 BHARADWAJA, R. C.
On the distribution and origin of the genus *Ischaemum* Linn.
Sci. & Cult. 1956 : **21** : 748–49.

From a survey of the distribution of species of *Ischaemum* the author concludes that the genus probably originated in peninsular India.

3059 Adati [Adachi], S. & Mitsuishi, S.
(Studies on breeding wild Japanese grasses as forage crops. II. On geographical variation in the heading date of *Miscanthus sinensis*).
Mie Dagaku Nogakubu Gakujutsu Hokoku/Bull. Fac. Agric. Mie Univ. 1956 : No. 13 : 1–5. [Japanese].
The heading dates of a series of samples collected from all over Japan were investigated at Mie University. Strains from northern Japan tended to head earlier but were also more variable in respect of heading date than strains from southern Japan (cf. Abst. 608).

3060 Adati [Adachi], S. & Mitsuishi, S.
(Studies on breeding wild Japanese grasses as forage crops. III. On the cultivation of *Miscanthus sinensis* var. *condensatus* on Hachijoshima).
Mie Dagaku Nogakubu Gakujutsu Hokoku/Bull. Fac. Agric. Mie Univ. 1956 : No. 13 : 7–12. [Japanese].
Descriptions are given of the varieties of the above grass grown on the island of Hachijoshima which lies a hundred or so miles to the south-east of the Japanese mainland. The varieties all have $2n = 38$ except Hiroba in which $2n = 40$.

3061 Hirayoshi, I., Nishikawa, K. & Kubono, M.
(Cytogenetical studies on forage plants. V. Polyploidy and geographical distribution of 3 species of *Miscanthus*).
Gifu Daigaku Nogakubu Kenkyu Hokoku/Res. Bull. Fac. Agric. Gifu Univ. 1956 : No. 7 : 9–14. [Japanese].
The following somatic chromosome numbers were determined: *M. tinctorius* and *M. oligostachyus*, $2n = 38$; and *M. intermedius*, $2n = 114$ (cf. *PBA*, XXVI, Abst. 3409).

3062 Kamiya, T., Shigeno, K., Sawano, Y. & Sayama, M.
[On the nutritive value of sorgo hybrids (sweet sorghum x Sudan grass)].
Gifu Daigaku Nogakubu Kenkyu Hokoku/Res. Bull. Fac. Agric. Gifu Univ. 1956 : No. 7 : 143–46. [Japanese].
Data are provided on the protein, fat, non-nitrogenous extract and fibre contents of the sorgo x Sudan grass hybrids described in *PBA*, XXVI, Absts. 3405–7.

3063 Hirayoshi, I., Nishikawa, K., Matumura [Matsumura], M. & Yamada, T.
(Studies on breeding sorgo hybrids. IV. On competition between densely planted F_2 plants).
Gifu Daigaku Nogakubu Kenkyu Hokoku/Res. Bull. Fac. Agric. Gifu Univ. 1956 : No. 7 : 1–8. [Japanese].
Continuing the researches summarized in *PBA*, XXVI, Abst. 3405–7, the authors compared the range of variation in plant characters in dense and open plantings of segregating F_2 populations of sorgo x Sudan grass hybrids. It was found that variation was reduced in thick plantings, especially in the aftermath, presumably because of competitive interaction.

3064 Yasue, T.
(Studies on interspecific hybridization in *Digitaria*. I. Hybridization technique).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 197–201. [Japanese].
Hot-water emasculation techniques suitable for *D. ciliaris* and *D. ischaemum* are described.

3065 Shimizu, M.
(The physiology and ecology of *Digitaria* plants. VI. The Japanese species of *Digitaria*).
Kyushu Daigaku Nogakubu Gakugei Zasshi/Sci. Bull. Fac. Agric. Kyushu Univ. 1956 : **15** : 409–23. [Japanese].
This taxonomic review includes descriptions of three newly differentiated forms of *D. adscendens*.

3066 Skalińska, M.
Chromosome number and accessories in *Avena versicolor* Vill.
Acta Soc. Bot. Polon. 1956 : **25** : 713–18.
Fourteen chromosomes were found in root-tip cells of all but three plants of a collection of *A. versicolor* from the High Tatra. Two of the exceptional plants had one small accessory chromosome and the third had two. The accessories appeared to be transmitted regularly at mitosis.

3067 Connor, H. E.
Interspecific hybrids in New Zealand *Agropyron*.
Evolution, NY 1956 : **10** : 415–20.
A study was made of the fertility of hybrids involving *A. scabrum* ($2n = 42$), *A. kirkii* ($2n = 42$), *A. tenue* ($2n = 56$) and *A. enysii* ($2n = 28$). F_1 *A. kirkii* x *A. scabrum* and the

reciprocal showed low fertility; the F_2 hybrids were sterile or unobtainable. The first backcross progenies had greater fertility than the F_1 hybrids. Other F_1 combinations were sterile. On the basis of these results and also ecological and morphological data (cf. *PBA*, XXIV, Abst. 2085), *A. enysii* and *A. tenue* are each given cenospecific status while *A. kirkii* and *A. scabrum* are regarded as representing two ecospecies which together form a third cenospecies.

3068 Nielsen, E. L.
Cytology and breeding behavior of a natural *Agroelymus* hybrid.
Bot. Gaz. 1956 : **118** : 79–88.

A progeny developed from F_1 seed collected from an *Elymus*-like plant growing in Alberta included individuals essentially similar to *Agropyron trachycaulum* or *Elymus glaucus* in morphological characteristics. Open-pollinated progenies obtained from six F_2 plants representing both types were uniform in morphological features and resembled their respective ♀ parents. Macrosporogenesis in F_3 plants was normal, no evidence of apomixis being obtained. Although pollen meiosis was fairly regular and the frequencies of micronuclei at the dyad and quartet stages were low, pollen abortion was complete in about half of the plants examined. Breeding and cytological behaviour suggested that elimination of ♂ and ♀ gametes carrying translocations occurred. Less than half of the pollen sterility observed was attributable to cytological disturbances. The remainder may have been cytoplasmic in origin, pollen-fertile plants probably only arising from the reception of pollen from *Agropyron*-like and *Elymus*-like plants into the corresponding types of cytoplasmic background.

LEGUMINOUS FORAGE PLANTS

Australian Plant Nutrition Conference held at University of Melbourne, Victoria, February-March, 1956 : **1** : Pp. 452. (Mimeographed).

3069 *Millikan, C. R. Interaction between magnesium and iron in the nutrition of certain varieties of subterranean clover.* (*pp. 284–86*).

Differences have been found at the Department of Agriculture, Victoria, between varieties of subterranean clover in respect of their response to magnesium deficiency and the effect of iron level on the reduction in growth caused by magnesium deficiency.

3070 *Nutman, P. S. The influence of host species and strain upon symbiotic effectiveness.* (*pp. 326–36*).

In this article the author briefly summarizes work carried out on host specificity in the Leguminosae and some of the problems involved in mutual adaptation between host and bacteria.

3071 *Paton, D. F. Rhizobium—plant nutrient interactions in pasture legumes.* (*pp. 360–65*).

Marked variation between and within species in effectiveness for nodule production has been shown by 14 strains of *Rhizobium* spp. tested on several *Trifolium* species in north-west Tasmania.

3072 Picard, J., Demarly, Y. & Hutin, C.
Espèces et variétés de légumineuses. (**Species and varieties of leguminous crops**).
Bull. tech. Ing. Serv. agric. 1956 : 801–12.

The comparative merits of varieties of lucerne, red and white clover and sainfoin recently tested at the Central Station of Genetics and Plant Breeding, Versailles, are discussed with reference to yield, maturation period, quality of the fodder produced, suitability for grazing purposes and resistance to frost, drought and diseases.

3073 Davies, W. E.
Herbage legume research at Aberystwyth.
World Crops 1957 : **9** : 103–06.

The outline of recent breeding included in this article on research at the Welsh Plant Breeding Station, Aberystwyth, deals mainly with agronomic and genetical problems encountered in strain building and testing in lucerne and white and red clover.

3074 Buller, R. E. & Ramirez, M.
Rendimientos de variedades de alfalfa en el Valle de México. (**Yields of lucerne varieties in the valley of Mexico**).
Agric. téc. Méx. 1955 : **1** : No. 2 : p. 16, 45.

Details are given of the performance of 11 local and introduced varieties tested during 1953–55 at Chapingo, Mexico.

3075 **Better creeping alfalfas.**
What's New Crops Soils 1957 : **9** : No. 5 : p. 23.

Two types of creeping lucerne are being developed by the US Department of Agriculture, one which develops new plants from creeping roots and the other in which new shoots arise from rhizomes. It is hoped to improve both the yield and adaptability of

these types or to transfer their creeping habit to high-yielding hay varieties.

Report of the Fifteenth Alfalfa Improvement Conference held on September 5-7, 1956 at St. Paul, Minnesota : Pp. 70. (Mimeographed).

In addition to the contributions summarized below, the report includes brief reports of the committee on screening of alfalfa breeding stocks and of other committees, and a section on pollination and seed production.

3076 *Sprague, E. W. Interspecific hybridization of three diploid* Medicago *species.* (*pp. 2–3*).

In addition to the information already given on hybrids involving *M. sativa, M. falcata* and *M. gaetula* (cf. Abst. 621), it is briefly reported that *M. sativa* and *M. gaetula* appear to be genetically similar for flower colour.

3077 *Crowle, W. L. & Bolton, J. L. Heritability of yield, leaf weight and protein content in alfalfa.* (*pp. 3–6*).

Heritability estimates were calculated for selfed and polycross progenies by using (1) the regression of progeny upon parental values, (2) the ratio of variance differences and (3) the variance-component method. Estimates for leaf weight were high, except for those obtained by (3). The values for the heritability of this property were higher when calculated from (1) than from (2) but the values for heritability of green weight were higher when determined by (2); no explanation of this reversal could be offered. The regression coefficients for protein content of selfs on clones and of polycrosses on clones were not significant.

3078 *Lewis, W. M. & Elling, L. J. The inheritance of a lethal character in alfalfa.* (*pp. 7–9*).

Evidence has been obtained suggesting that a lethal character causing death 4–12 weeks after emergence depends upon two complementary genes, *Le* and Le_2, which are inherited tetrasomically. It is postulated that Minn. 244 is tetrasomic for *Le* and le_2 while Minn. 233, Minn. 255 and Minn. 265 are each tetrasomic for *le* and Le_2.

3079 *Dudley, J. W. & Wilsie, C. P. Inheritance of branched raceme and vestigial flower in alfalfa.* (*pp. 9–10*).

Further investigations have led to the hypothesis that each of the above characters is controlled by at least four genes, two being tetrasomically inherited and the other two behaving as duplicate disomic genes (cf. *PBA*, XXVI, Absts. 1033 and 2463). The four loci governing normal *vs.* branched inflorescence are designated *A*, *Br*, *Ra* and Ra^1, those controlling normal *vs.* vestigial flower, *D*, *V*, *F* and F^1.

3080 *Hanson, C. H., Cope, W. A. & Hanson, W. D. Estimating dominance and additive variances in alfalfa populations arising from crosses involving heterozygous parents.* (*p. 11*).

A method of estimating dominance and additive variances by means of data on progenies of heterozygous parents has been devised. Applied to the study of reaction to rust, the dominance variance was of nearly the same magnitude as the additive. Attention is drawn to scoring across plots as a means of securing less biased data for estimating variances than consecutive scoring of plants within a plot, in cases where more precise methods of evaluation cannot be applied. Genetic linkage between the character under analysis and incompatibility requires consideration as a possible source of bias.

3081 *McLennan, H. A. Summary report on developments in alfalfa improvement research in Canada.* (*pp. 12–14*).

A cooperative project at Saskatoon and Lethbridge to produce a bacterial-wilt resistant variety improved in hardiness, yield and recovery has resulted in experimental synthetics. Breeding for resistance to winter crown rot continued at Saskatoon and Edmonton, some progress having been made in imparting resistance derived from *M. falcata* to *M. sativa* types with better seed retention. The association detected between low pH and resistance to winter crown rot may provide the basis of a screening technique. Black-stem resistance is being sought at Saskatoon and Winnipeg. Development of drought-resistant varieties for hay or pasture continued at Swift Current. The synthetic Rambler (cf. *PBA*, XXVI, Abst. 467) is undergoing improvement in percentage of creeping-rooted plants, seed yield and uniformity. Creeping-rooted strains with wilt resistance and rapid recovery are being developed for irrigated conditions. At Ottawa and Ste. Anne de la Pocatière, breeding to produce pasture types better adapted to the eastern part of Canada is in progress. At Edmonton, work has been undertaken to develop a variety of *M. falcata* for pasture. An attempt is also under way to improve Ferax, chromosome-doubled plants from 2*n* strains being used as sources of wilt resistance and hardiness. Progress is being achieved in selection for tolerance of Mn toxicity in nutrient solutions. Progenies of

X-irradiated creeping-rooted clonal lines are being screened for mutants possessing characters such as resistance to black stem and bacterial wilt. The number of clones necessary in a synthetic for the maintenance of yield is being determined.

3082 *Hanson, C. H. Summary report of 1955 Eastern Regional Group.* (*pp. 14–15*).
Among the topics dealt with were the definition of breeder seed and future plans for polycross and other tests.

3083 *Davis, R. L. Summary report of 1955 Central Regional Conference Group.* (*pp. 16–17*).
Items discussed included methods of testing in polycross and synthetic nurseries and nomenclature of clones and synthetics.

3084 *McAllister, D. R. Alfalfa research in the western states.* (*p. 18*).
Lahontan is in considerable demand both commercially and as breeding stock since it offers resistance to the spotted aphid (*Therioaphis maculata*) which has now spread over much of the south-west of the USA (cf. *PBA*, XXV, Abst. 330).

3085 *Dessureaux, L. & Ouellette, G. J. Manganese and aluminum toxicity in relation to tolerance of alfalfa to acidity.* (*pp. 18–19*).
Clones, varieties and hybrids varied in reaction to Mn and Al toxicity and to Ca deficiency in sand cultures.

3086 *Smith, D. Differentials in growth habit as an aid in identifying changes during the seed increase of alfalfa.* (*pp. 19–21*).
Differences in growth habit in spaced populations at the University of Wisconsin have been found to provide a basis of recognizing genetic changes affecting a variety during seed increase and of studying the relationship between growth habit and winter survival.

3087 *Dexter, S. T. Growth behavior and winter hardiness of several alfalfa varieties.* (*pp. 21–24*).
In investigations at Michigan State University over several years, measurements of winter hardiness have been effected by freezing and electrolyte-exosmosis tests. Growth behaviour has been analysed by determining stem length, green and dry weights of the roots, amount of root branching and number of crown buds. Ladak has emerged as the most hardy variety, followed by Narragansett, Hardigan and Grimm. Short tops in winter and spring were associated with hardiness.

3088 *Schonhorst, M. H., Davis, R. L. & Carter, A. S. Interaction of variety, temperature, and day length among alfalfa types.* (*p. 25*).
Varieties were grown at 60°, 70° and 80° F., with a day length of 8, 12 or 16 hours at each temperature. The interactions variety x temperature, variety x day length and variety x temperature x day length were significant, as shown by data on plant height. The greatest difference in height was recorded between the hardy Vernal (5·8 cm.) and nonhardy African (10·0 cm.) at 60° F. and with a 12-hr. day. The entries were divided into three groups according to the magnitude of the variances: (1) Vernal, Ranger, Narragansett and Grimm, (2) Buffalo, Atlantic and du Puits and (3) African and a blend of 50% Ranger and 50% African.

3089 *Gross, H. D. & Wilsie, C. P. Some responses of alfalfa varieties to fertilizer applications and cutting treatments.* (*pp. 26–31*).
The results of a preliminary study of eight varieties grown at four levels of fertility and harvested by two systems of cutting at the Iowa State College indicated that interactions between the genotype and management practices may be important.

3090 *Howe, W. L. & Smith, O. F. Some characteristics of resistance in alfalfa to the spotted alfalfa aphid.* (*pp. 40–42*).
The different degrees of tolerance and antibiosis shown towards *Therioaphis maculata* are described for a number of varieties. Initial screening for tolerance based on aphid survival and further selection for antibiosis as indicated by aphid mortality usually assures a high overall resistance. Regardless of tolerance, selection for antibiosis is necessary if new varieties are to be free from honey dew. Some Turkistan types and hybrids between the resistant variety Lahontan and susceptible clones are highly tolerant and also contain a greater proportion of plants with a high degree of antibiosis than nontolerant types such as Chilean and Hairy Peruvian. African is undergoing selection for resistance. Antibiosis, as well as a mild tolerance, plays a role in determining resistance within this variety.

3091 *Smith, O. F. & Howe, W. L. Breeding alfalfa for resistance to the spotted alfalfa aphid.* (*pp. 43–44*).
Some of the F_1 plants obtained from crosses of the hardy variety Lahontan with nonhardy susceptible plants from African and with hardy aphid-susceptible types have shown a high

degree of antibiosis in investigations at Anaheim, Calif. Resistance due to antibiosis apparently depends to some extent on the age of the plant, hybrid seedlings showing a much lower ratio of resistant : susceptible plants than mature hybrids from the same crosses.

3092 *Stanford, E. H. Breeding alfalfa for resistance to the spotted alfalfa aphid.* (*p. 45*).
Introductions from Iran, Iraq, India and Afghanistan have been tested in California. Probably only one, PI220808, equals Lahontan in resistance. Antibiosis, tolerance and preference all appear to occur in resistant stocks. Breeding is however concentrated upon antibiosis. Data from the F_1 of Lahontan (clone C84) x African suggest that the combination of the resistance of Lahontan with the growth habit of African may be readily obtained.

3093 *Kernkamp, M. F. The blackstem diseases of forage legumes.* (*pp. 46–47*).
Breeding for resistance to symptoms described as black stem is handicapped by the complexity of the condition which may be caused by at least eight pathogens: *Phoma herbarum* var. *medicaginis* (= *Ascochyta imperfecta*), *Ph. trifolii*, *Cercospora zebrina*, *Colletotrichum trifolii*, *C. destructivum*, *Stemphylium botryosum*, *Pseudomonas medicaginis* and *Phytomonas alfalfae*. Lines of research required in order to develop reliable techniques for testing for resistance to the different organisms are proposed.

3094 *Hanson, E. W. The blackstem complex.* (*pp. 47–49*).
The investigations mentioned include study of the inheritance of resistance in lucerne to *Ph. herbarum* var. *medicaginis* and *Cercospora medicaginis* in South Dakota.

3095 *Brigham, R. D. Greenhouse and field methods of inoculating alfalfa with* Cercospora medicaginis *Ell & Ev.* (*p. 49*).
Methods tested at the Iowa State College are described. For inoculation in the greenhouse, use of mycelial suspensions is more practical than that of spore suspensions or diseased stems.

3096 *Carnahan, H. L. & Graham, J. H. Blackstem of alfalfa.* (*pp. 50–57*).
This review of the literature is concerned mainly with investigations on *Ascochyta imperfecta*, sections on the variation among isolates, host range, nature and inheritance of resistance, and screening techniques being given. An outline of methods employed in breeding for resistance to this pathogen at the US Regional Pasture Research Laboratory, University Park, Pa., is included.

3097 *Geise, H., Adams, M. W. & Semeniuk, G. The blackstem complex.* (*pp. 57–58*).
Clones differed in their reactions to *Cercospora zebrina* and *Ascochyta imperfecta* at the South Dakota State College. These differences were highly heritable, particularly in diploid clones, which were more resistant than the tetraploid.

3098 Lesins, K.
Interspecific hybrids between alfalfa, *Medicago sativa* L., and *M. dzhawakhetica* Bordz.
Agron. J. 1956 : **48** : p. 583.
The production of a triploid ($2n = 24$) from $2n$ *M. sativa* x $4n$ *M. dzhawakhetica* at the Department of Plant Science, University of Alberta, has already been reported (cf. *PBA*, XXIII, Abst. 2749). The present note deals chiefly with a hexaploid ($2n = 48$) obtained from $4n$ *M. dzhawakhetica* ♀ x $4n$ *M. sativa* ♂. Since the hybrid resembled the ♀ parent more closely, it is presumed that it arose through fertilization of an unreduced ♀ gamete. The self fertility of the hybrid was very low but its male fertility high. Back crossing to *M. saliva* resulted in plants with approximately $2n = 40$.

3099 Oldemeyer, R. K.
Distant relatives of cultivated alfalfa, *Medicago ruthenica* and *M. platycarpa*.
Agron. J. 1956 : **48** : 583–84.
Morphological features in which *M. ruthenica* ($2n = 16$) and *M. platycarpa* ($2n = 16$) resemble each other and differ from other species are noted, as the result of investigations at the Wisconsin Agricultural Experiment Station. When *M. platycarpa* ♀ was crossed with *M. ruthenica*, most of the flowers pollinated produced pods of normal size but the seeds aborted, with the exception of five from which hybrids were raised. The reciprocal mating did not lead to any development of the ovary. Morphologically intermediate between their parents, the hybrids were cross compatible with one another and with *M. ruthenica* ♂. Two hybrids were meiotically regular, two others contained a reciprocal translocation while in the fifth, 3–5 pairs of chromosomes were associated at late prophase and metaphase of division I. The basis of these disparities in meiotic behaviour is regarded as intraspecific in nature. *M. platycarpa* and *M. ruthenica* may carry valuable genes for drought and cold resistance but are probably so distantly related to the cultivated species that hybridization is not possible.

3100 Oldemeyer, R. K.
Interspecific hybridization in *Medicago.*
Agron. J. 1956 : **48** : 584–85.

Crosses involving species belonging to sections *Lupularia, Falcago* and *Spirocarpos* were attempted at the Wisconsin Agricultural Experiment Station, the chromosome numbers of *M. arabica, M. orbicularis, M. tuberculata* and *M. falcata* being doubled by colchicine treatment, for mating with species normally having $2n = 32$. Crosses between species in sect. *Falcago* were generally successful. Hybrids of *M. sativa* ($2n = 32$) with *M. hemicycla* ($2n = 32$) and $4n$ *M. falcata* were readily obtainable; crosses of $2n$ *M. falcata* with $2n$ *M. sativa* var. *parviflora* were also successful. It may be possible to raise *M. scutellata* x *M. sativa* hybrids with the aid of embryo culture.

3101 Andrukovič, V. I.
(Material on the botanical and agronomic characteristics of *Medicago polychroa* Grossh.)
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 1024–28. [Russian].

M. polychroa is endemic in central Transcaucasia. Being hardy and more resistant to fungal attack than any other *Medicago* species, it is considered interesting for breeding and information is presented concerning its habitat and the morphological and agronomic features of the forms collected. It is less drought resistant than *M. coerulea* but more resistant than *M. sativa* and some of the other wild species. It gives several cuts and a fairly high total yield of green matter.

3102 Heyn, C.
Some chromosome counts in the genus *Medicago.*
Caryologia 1956 : **9** : 160–65.

Chromosome numbers of 19 species, 15 of which were collected in Israel, are listed. Those of *M. blancheana* ($2n = 16$) and *M. galilaea* ($2n = 18$) are reported for the first time. Numbers in the other species agree with those recorded by previous investigators, except in *M. ciliaris* and *M. rotata*, with $2n = 18$, instead of $2n = 16$, as previously reported. Pretreatment of the root tips with α-bromonaphthalene, p-dichlorobenzene or oxyquinoline made it possible to distinguish between metacentric and submetacentric chromosomes. In most species, the majority of chromosomes were metacentric. The discovery of $2n = 18$ in the above three species suggests that the genus has the basic number of $x = 9$, in addition to $x = 8$ and 7. These three species, however, each contained one pair of conspicuously small metacentric chromosomes which may possibly be supernumeraries.

3103 Fyfe, J. L.
Relational incompatibility in diploid and tetraploid lucerne.
Nature, Lond. 1957 : **179** : 591–92.

Data obtained at the Plant Breeding Institute, Cambridge, England, have revealed an inverse proportionality, in both *Medicago sativa* ($2n = 32$) and *M. coerulea* ($2n = 16$), between fertility and the degree of inbreeding represented by the matings in question. This situation is referred to as "relational incompatibility". Such incompatibility could result from "interaction between gametophytes before fertilization" but after entry of the pollen tubes into the ovules or from "interaction within and between gametic complements after fertilization". It is suggested that there is "no reason why both relational- and self-incompatibility should not operate in tandem".

3104 Konstantinova, A. M.
(Changing wild forms of perennial plants into high yielding varieties).
Agrobiologija (Agrobiology) 1956 : No. 4 : 31–39. [Russian].

Breeding work on lucerne at the Williams Forage Institute, Moscow province, is discussed. Wild forms introduced from districts with different climatic and soil conditions are grown for several generations in an altered environment. This shatters their heritable constitution and improves their crossability with cultivated lucernes. Mention is made of a hybrid progeny from a wild form from the Angara basin, on account of its productivity and tolerance of acid soil.

3105 Rodger, J. B. A., Williams, G. G. & Davis, R. L.
A rapid method for determining winterhardiness in alfalfa.
Agron. J. 1957 : **49** : 88–92.

Seeds were germinated in solutions of sodium chloride and sucrose having known osmotic pressures. As the osmotic pressures increased, the rate and amount of germination of the seeds of all the varieties tested underwent a decrease. This reduction was however very much more marked in the hardy than in the nonhardy varieties.

3106 Graber, L. F.
Registration of varieties and strains of alfalfa.
Agron. J. 1956 : **48** : 587–88.

The synthetic variety Vernal, recently registered

in the USA, is described (cf. *PBA*, XXIII, Abst. 2008). Its parentage comprised selections of Cossack and F_2 plants of *Medicago media* x *M. falcata*. Two representatives of *M. media* entered into this cross: a winter-hardy selection of Kansas Common and a plant of Ladak. All the components of Vernal were resistant to bacterial wilt.

3107 Schonhorst, M. H., Davis, R. L. & Carter, A. S.
Response of alfalfa varieties to temperatures and daylengths.
Agron. J. 1957 : **49** : 142–43.

When ten varieties of lucerne were grown at Purdue University Agricultural Experiment Station at three different temperatures and under three different photoperiods at each temperature, it was found that the greatest differences in growth response occurred at 60° F., under 12-h. photoperiods, and that the varieties fell into three groups according to the magnitude of the variances, varieties within each group being significantly different in height from varieties in the other groups.

3108 Schmidt, F.
Ein Beitrag zur Sortenfrage bei Rotklee. (**A contribution to the variety question in red clover**).
Mitt. dtsch. LandwGes. 1957 : **72** : 153–55.

The results of trials of German and foreign varieties of red clover in Baden-Würtemberg, Germany, are summarized.

3109 Wirén, G.
Tetraploid rödklöver Weibulls Rea. (**The Weibull tetraploid red clover Rea**).
Weibulls ill. Årsb. 1957 : **52** : 30–32.

The good qualities shown by the tetraploid Rea, developed from the Danish variety Hersnap, include high yield in both first and second year and resistance to eelworm and *Sclerotinia trifoliorum*.

3110 Picard, J.
Contribution à l'étude de l'hérédité du caractère "fleur pourpre" chez le trèfle violet *Trifolium pratense* L. (**Contribution to the study of the inheritance of the purple flower character in red clover, *T. pratense* L.**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B : 1956 : **6** : 141–49.

Studies of the F_1, F_2 and back-cross progenies of crosses involving purple-flowered mutants of *T. pratense* on the one hand and white-flowered, pink-flowered and red-flowered plants on the other led to the conclusion that the occurrence of purple flowers is due to the action of a single recessive gene, designated *p*. The production of pink flowers appears to be caused by the interaction of the recessive gene *c*, for white flowers, and one of two other recessive genes, designated *y* and *d*. These results differ from those obtained by Nijdam in 1951 (cf. *PBA*, XXII, Abst. 1991).

3111 Klimenko, G. A.
(Cultivating red clover in the districts of the Saĭfun-Hankanskaja plain).
Zemledelie (Agriculture) 1956 : No. 10 : 112–13. [Russian].

Primorskiĭ 28, the new standard for the Habarovsk and Primorskiĭ territories, was bred at the Primorskiĭ Research Station from wild material originating in the Altaĭ and Siberia. It is long lived and hardy under snowless winter conditions and overwinters well under a layer of snow 5–6 cm. deep. It can be grown for hay and seed for 6–7 years.

3112 Horošaĭlov, N. G.
(Breeding red clover).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 4 : 44–49. [Russian].

This article, dealing mainly with the selection techniques employed in the USSR, mentions selections from wild populations, in particular hardy forms from the Čuja and Pečora basins, the former adapted to cultivation in Kirgizia and the latter to cultivation in the Komi ASSR.

3113 Athow, K. L. & Davis, R. L.
Inheritance studies on northern and southern anthracnose of red clover.
Phytopathology 1957 : **47** : p. 2. (Abst.).

Inheritance studies indicate that resistance to *Colletotrichum trifolii* is conditioned by a single recessive factor and that the same is probably true of resistance to *Kabatiella caulivora*, although some anomalous results were obtained in the latter case. Some plants resistant to both diseases were found among the F_2 progeny of Dolland x Kenland and Purdue x Kenland, the former variety in each case possessing resistance to *K. caulivora* and the latter to *C. trifolii*.

3114 Dijkstra, J.
Experiences with the breeding of red clover resistant to the stem eelworm.
Euphytica, Wageningen 1956 : **5** : 298–307.

Details are given of the reaction of nine red clover varieties to *Ditylenchus dipsaci* from Gendringen and Roosendaal. Some increase in resistance has been obtained by intercrossing and selection among resistant plants.

3115 Zwingli, W.
Untersuchungen über die Fertilitätsverhältnisse in schweizerischen Weissklee-Populationen mit ergänzenden zytologischen Studien. (Research on fertility relationships in Swiss white clover populations supplemented by cytological studies).
Z. Pflanzenz. 1956 : **36** : 237–88.

The genetics of self incompatibility in *Trifolium repens* was studied in four local populations from eastern Switzerland. Slight differences were noted between the four provenance types in degree of self incompatibility but an average seed set of only 0·01 per flower was obtained from self pollinations, as compared with an average of 3·46 from cross pollinations. Chromosome counts of root-tip cells showed all the plants to be diploids with $2n = 32$, thus eliminating the possibility of self fertility being associated with tetraploidy. Seventeen plants each of two of the four provenance types were crossed *inter se*; a study of the degree of self incompatibility in the F_1 generation suggested that a large number of genes, at least 14 and possibly as many as 26, control self incompatibility. Plants of the I_1 generation obtained from selfing proved considerably more self fertile than their parents but this reduction in self incompatibility was largely lost when the I_1 plants were back crossed to their respective parent plant.
Cytological studies of meiosis in the pollen mother cells of the initial material showed lagging chromosomes and chromosome bridges at anaphase. The percentage of nonviable pollen produced varied from 10 to 30% and differences in the average percentage of nonviable pollen grains were noted between provenance types. The average number of ovules per flower also varied according to provenance type.
Studies on the inheritance of V leaf markings and chlorophyll deficiences suggested that both characters were controlled by single recessive genes, neither of which appeared to be linked with any of the genes for self incompatibility.

3116 Black, J. N.
The early vegetative growth of three strains of subterranean clover (*Trifolium subterraneum* L.) in relation to size of seed.
Aust. J. agric. Res. 1957 : **8** : 1–14.

In a study of pot-grown plants of Bacchus Marsh, Clare and Mount Barker, dry weight at any given time in the early vegetative stage was linearly related to embryo weight but was independent of strain. Any differences noted between these strains when grown under similar environmental conditions are therefore the result of differences in the proportions of seeds belonging to different size classes. Leaf area per plant was also linearly related to embryo weight and independent of strain. Compared with Bacchus Marsh and Mount Barker, Clare had fewer but larger leaves.

3117 Brockwell, J.
The use of the red leaf strain of subterranean clover for rapid evaluation of strain effectiveness in *Rhizobium trifolii*.
J. Aust. Inst. agric. Sci. 1956 : **22** : 260–65.

The fact that anthocyanin pigmentation disappears from the leaves of the Red Leaf strain of subterranean clover upon effective nodulation offers the basis of a technique for assessing the effectiveness of strains of *Rh. trifolii*.

3118 Walker, J.
The reaction of subterranean clover varieties to scorch caused by *Kabatiella caulivora* (Kirchn.) Karak.
J. Aust. Inst. agric. Sci. 1956 : **22** : 288–91.

Trifolium spp. and varieties of *T. subterraneum* were inoculated with *K. caulivora*. With the exception of the varieties Mulwala and Wallace of *T. subterraneum*, all the entries were attacked in some degree.

3119 Offutt, M. S. & Baldridge, J. D.
Inoculation studies related to breeding for resistance to bacterial wilt in lespedeza.
Res. Bull. Mo. agric. Exp. Sta. 1956 : No. 603 : Pp. 47.

Histological studies at the College of Agriculture, University of Missouri, have shown that *Xanthomonas lespedezae* travels more rapidly in the xylem vessels of susceptible strains of lespedeza than in those of resistant strains. Procedures for measuring resistance to bacterial wilt under greenhouse and field conditions and for selecting resistant individuals in large populations are discussed.

3120 Johnson, I. J. & El Banna, A. S.
Effectiveness of successive cycles of phenotypic recurrent selection in sweetclover.
Agron. J. 1957 : **49** : 120–25.

In studies of the effectiveness of recurrent selection over four generations at the Iowa Agricultural Experiment Station, it has been found that greater improvements occur in respect of growth habit than in respect of plant

vigour, indicating that the heritability value of the former character is higher. Differences between the average yields of the selected groups of plants increased in each successive cycle and several of the S_1 lines derived from the highest yielding populations were more productive than their parental variety, Madrid. It is concluded, from the degree of progress made, that phenotypic recurrent selection is of value as a rapid and efficient method for improving cross-pollinated forage plants.

3121 Scheibe, A. & Hülsmann, G.
Über das Auftreten bitterstoffarmer Pflanzen von *Melilotus albus* in der C_2-Generation nach Behandlung mit mutagenen Chemikalien. (**On the occurrence of plants of *M. albus* with little bitter principle in the C_2 generation after treatment with mutagenic chemicals**).
Naturwissenschaften 1957 : **44** : 17–18.

At the Plant Breeding Institute of Göttingen University, Germany, growing shoots of *M. albus* were treated with $AlCl_3$, $Al(NO_3)_3$, glycol and mixtures of ethyl urethane and KCl and glycol and KCl. The C_1 plants obtained were then intercrossed and the C_2 examined for the occurrence of mutations. Several mutants were found to possess a coumarin content considerably lower than that of the initial material. Of the mutagenic substances employed in these experiments, $AlCl_3$ proved the most effective in inducing mutants with a low coumarin content.

3122 Hackbarth, J.
Anbau und Züchtung der Süsslupinen in verschiedenen Ländern. (**Cultivation and breeding of sweet lupins in different countries**).
Saatgutwirtschaft 1957 : **9** : 7–9, 38–40.

The author outlines briefly the results achieved in the last 25 years in the breeding of sweet lupins, in particular *Lupinus albus*, in Germany and elsewhere, discusses the importance of this crop to different countries and lists research stations throughout the world at which breeding work on sweet lupins is being carried out.

3123 Hackbarth, J.
Die Gene der Lupinenarten. I. Gelbe Lupinen (*Lupinus luteus* L.). [**The genes of the lupin species. I. Yellow lupin (*L. luteus* L.)**].
Z. Pflanzenz. 1957 : **37** : 1–26.

The morphological and physiological characters governed by the 43 genes of *L. luteus* known to research workers are listed and the genetical constitutions of some of the more important varieties of yellow lupin are given, together with a comprehensive bibliography of breeding work carried out on this species. Of the 43 genes described, 28 govern morphological characteristics and 15 physiological properties, 38 are inherited as recessives and 5 as dominants, 21 arose as the result of spontaneous mutation and 22 were induced by X irradiation. Several of the genes studied were found to possess a pleiotropic effect. It is pointed out that, as the result of breeding work carried out on the sweet lupin, in particular in Germany, a new secondary gene centre of *L. luteus* has arisen in the course of this century.

3124 Hackbarth, J.
Die Gene der Lupinenarten. II. Schmalblättrige Lupine (*Lupinus angustifolius* L.). (**The genes of the lupin species. II. *L. angustifolius* L.**).
Z. Pflanzenz. 1957 : **37** : 81–95.

The history of breeding work on *L. angustifolius* is reviewed and the morphological and physiological characteristics governed by the 26 genes of this species known to research workers are listed; the genes *latifolius*, *purpureus*, *leucospermus*, *niveus* and *violaceus* were found to be pleiotropic. Of the 26 genes described, all of which are recessive, 22 govern morphological and 4 physiological characteristics. All but 6 resulted from spontaneous mutations. The genetical constitutions of some of the more important cultivated varieties are discussed. As in the case of *L. luteus* (cf. Abst. 3123), a secondary gene centre for this species has arisen as the result of breeding work carried out in Europe, in particular Germany.

3125 Hackbarth, J.
Der Entwicklungsrhythmus bei *Lupinus albus* und seine Bedeutung für Anbau und Züchtung. (**The rhythm of development in *L. albus* and its significance for cultivation and breeding**).
Z. Pflanzenz. 1956 : **36** : 434–44.

The effect of sowing time, photoperiod and temperature on a number of strains of *L. albus* of different provenance is discussed with reference to current breeding work at the Max Planck Institute for Breeding Research, Scharnhorst, Germany. Tall, medium and short forms were distinguished, these different types having arisen by mutation in the course of the last few decades. The short form, which matures earlier than the others, is the most promising under Central European conditions and has arisen as the result of the mutation of a single gene from the dominant to the recessive condition. All

the strains of *L. albus* studied were day neutral but temperature at time of germination exercised a considerable effect on the subsequent vegetative development of some strains, in particular the short forms. Breeding of thermoneutral short forms is now being attempted as this type would appear to be of greater practical value to the farmer than the thermosensitive types.

3126 Atabekova, A. I. & Nekipelova, I. A.
(The flowering of some lupin species).
Izv. Timirjazev. seljskohozjaĭstv. Akad. (News Timirjazev agric. Acad.) 1956 : No. 2 : 99–106. [Russian].

The following observations on *Lupinus* species in a collection at the Timirjazev Agricultural Academy are reported. Most species were found to be allogamous, but were not obligate cross pollinators. Those originating from the western hemisphere tended to cross pollinate more readily than those from the eastern hemisphere. Autogamy was characteristic of *L. angustifolius* and to a lesser extent of *L. albus*. The best time for emasculating flowers is just before the bracts are shed. It is essential to remove all ten anthers.

3127 Schieblich, J.
Futterpflanzenneuzüchtungen. IV. *Phacelia tanacetifolia*—Büschelkraut. **(New strains of forage plants. IV. *Ph. tanacetifolia*).**
Dtsch. Landw., Berl. 1957 : **8** : 19–21.

Strains of *Ph. tanacetifolia* suitable for use as green fodder have been selected at the Bernburg Plant Breeding Station, East Germany, from local material. They are highly resistant to frost, have a higher leaf/stem ratio and larger leaves than the initial material, grow more rapidly, have a shorter flowering period and produce more seeds. In addition, strains with glabrous leaves are being developed.

ROOTS AND TUBERS

3128 Oksijuk, P. F.
(Fertilization in beet in connexion with the so-called somatic fertilization).
Bot. Ž. (Bot. J.), Kiïv 1955 : **12** : No. 3 : 44–51. [Ukrainian].

Research on fertilization in beet by Zaĭkovskaja is criticized chiefly on the ground of inadequate technique (cf. *PBA*, XXIII, Abst. 533 and XXV, Abst. 436). The writer rejects the concept of somatic fertilization generally and in particular the theories of Ellengorn and Svetozarova which are also said to be based on faulty technique (cf. *PBA*, XX, Abst. 1421 and XXI, Absts. 1602 and 2368).

3129 Medvedeva, A. S.
(Selectivity of fertilization in the beetroot and sugar beet).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1956 : **17** : 335–39. [Russian].

At the Ukrainian Horticultural Institute, open-pollinated seed parents, whether beetroot or sugar beet, preferred foreign to self pollen, but the percentage of hybrids among the progeny of sugar beet mother plants was a little higher than in beetroot. The results of artificial crosses were as follows. (1) Both beetroot and sugar beet gave higher percentages of hybrids than maternal types on pollination with a pollen mixture of equal parts of self and foreign pollen, but there were more hybrids from sugar beet mother plants than from beetroot. (2) When pollinated with pollen mixtures comprising unequal amounts of self and foreign pollen, a higher percentage of plants resulted from fertilization by the pollen present in small quantities than would have been expected. (3) On pollination by self pollen and 30 min. afterwards by foreign pollen, the F_1 was mainly of the maternal type. In the progeny of crosses from sugar-beet mother plants, the percentage of hybrids was higher than from beetroot. More hybrids than maternal types resulted from pollination first with foreign pollen and then self pollen. The number of hybrids from sugar-beet mother plants exceeded that from beetroot.

3130 Kovács, A.
Virus yellows of sugar and forage beets in Hungary.
Acta agron., Budapest 1956 : **6** : 259–86.

In studies carried out in Hungary since 1953, the above disease proved to be widespread and no varieties showing resistance have been found among collections of sugar beets, mangels, beetroots, *Beta maritima* and *B. macrocarpa*. *B. trigyna* and the tetraploid *B. patellaris* displayed only mild symptoms but are not readily crossed with other species, so that breeding for resistance is likely to prove difficult.

3131 Wichmann, W.
Leistungsanlagen und züchterische Probleme der Futterrüben und Kohlrüben unter besonderer Berücksichtigung deutscher Verhältnisse. **(Yield components and breeding problems in mangels and swedes with special reference to German conditions).**
Z. Pflanzenz. 1957 : **37** : 27–40.

After discussing the bearing of soil and climatic

conditions on the choice of root crop to be grown, the author presents tabulated data on the yields of roots, dry matter and foliage and contents of dry matter, ash, nitrogen and protein of the more important varieties of mangel grown in western Germany. The most urgent problems in mangel breeding in Germany are stated to be increased resistance to *Cercospora beticola* and virus yellows, suitability for mechanical harvesting and mechanical topping and improved keeping properties in the clamp. Further factors that require study are varietal differences in the content of salts in the mangel. The exploitation of heterosis in mangels and swedes involves the selection of varieties with good combining properties and foreign as well as German varieties should be used in experiments towards this end. In the case of the swede, the principal aims are to improve the protein, dry matter and carotene contents of the roots and to obtain varieties with increased resistance to mildew and crinkle virus.

3132 Voederbieten, 1957. (**Mangels, 1957**). Landbouwvoorlichting **14** : Bijl. 1 : Ber. Rassenkeuze 1957 : No. 218 : Pp. 5.

Brief descriptions are given of the more important varieties grown in the Netherlands. The information provided, which is based on the results of trials held in recent years in different parts of the country, includes particulars of root and foliage yields, dry matter content and yield, tendency to bolting, keeping quality and ease with which the roots may be lifted.

Atti del 2° Convegno annuale della Società Italiana di Genetica Agraria al Centro Appenninico Terminillo-Rieti, 27–29 Agosto 1955 su il miglioramento genetico della patata e del pomodoro. (**Proceedings of the 2nd annual meeting of the Italian Society of Agricultural Genetics at the Apennine Centre at Terminillo-Rieti on 27-29 Aug. 1955 on the genetic improvement of the potato and the tomato**). Genet. agr. 1956 : **6** : 17–404.

The proceedings of the meeting include the full texts of the inaugural addresses, the papers read and the discussions.

3133 *Montanari, V. La coltura della patata in Italia: osservazioni e proposte.* (*Potato cultivation in Italy: observations and proposals*). (*pp. 99–112*).

A general plan for research on problems concerned with potato growing in Italy is put forward. One of the suggestions is that more attention should be given to the old varieties that in many localities are being or have been superseded by newer types not always so well adapted ecologically.

3134 *Avanzi, E. Miglioramento genetico della patata in Italia e problemi relativi.* (*Genetic improvement of the potato in Italy and related problems*). (*pp. 113–19*).

This contribution has been summarized in *PBA*, XXVI, Abst. 2494.

3135 *Black, W. Breeding potatoes for resistance to virus and other agents of disease.* (*pp. 120–38*).

This article is an expanded version of that already summarized in Abst. 148.

3136 *Dorigatti, R. Possibilità di costituzione e di allevamento in Italia di varietà di patate adatte all'ambiente Italiano.* (*Possibilities of producing and raising in Italy varieties of potato adapted to the Italian environment*). (*pp. 153–57*).

Two forms of degeneration are distinguished, one due to virus diseases and one to ecological causes. The variety San Michele (cf. *PBA*, XXVI, Abst. 2494) illustrates the fact that it is possible to produce healthy varieties in Italy and maintain them in a healthy state.

3137 *Grancini, P. In quale ambiente dobbiamo cercare le varietà di patate adatte per l'Italia settentrionale?* (*In what environment should we look for potato varieties adapted to northern Italy?*) (*pp. 296–302*).

It is pointed out that the forms adapted to the ecological conditions of southern Europe have usually been discarded during selection, since the main potato breeding work has been done in northern countries. American varieties such as Katahdin and Kennebec have proved better adapted to Italian conditions, and correspond more closely to the national taste, than those from Germany or the Netherlands and Italian breeders are recommended to produce varieties of this type.

3138 *Ciccarone, A. Gli aspetti fitopatologici della coltura del pomodoro in Italia.* (*Phytopathological aspects of tomato cultivation in Italy*). (*pp. 303–40*).

A conspectus is presented of the diseases and pests attacking the tomato in Italy, followed by indications of the varieties grown in different parts of the country, including Sicily, and the principal maladies to which they succumb. The urgent necessity for a programme of breeding resistant varieties combined with a full study of the biology and specialization of the causal organisms of the main diseases is emphasized, it being pointed out that many varieties introduced from abroad as resistant to a particular

parasite have proved susceptible in Italy; they are also unsuitable for Italian conditions for a number of other reasons.

3139 *Swaminathan, M. S. Cytogenetics of potato species and its bearing on potato breeding procedures.* (*pp. 341–42*).

The differentiation of the tuber-bearing *Solanum* species of South America and Mexico is thought to have occurred by means of four processes, (1) gene mutation and substitution, (2) small structural changes in chromosomes, (3) large structural changes in chromosomes and (4) changes in the cytoplasm, and the bearing of these observations on the use of interspecific hybridization in potato breeding is discussed. A technique for obtaining hybrids between cross-incompatible species is described (cf. *PBA*, XXVI, Abst. 1416) and the nature and origin of tetraploidy in *S. tuberosum* is briefly discussed.

3140 *Pal, B. B. & Singh, H. B. Tomato breeding at the Indian Agricultural Research Institute (New Delhi).* (*pp. 343–44*).

The American variety Sioux and a selection from *Lycopersicon esculentum* x *L. pimpinellifolium*, named Pusa Red Plum, have done well in parts of India (cf. *PBA*, XXVI, Abst. 759). Selections from Sioux x Meeruti combine the good qualities of both parents and are superior to Meeruti. Some F_1 hybrids show considerable hybrid vigour and it is hoped to develop male-sterile lines of both these varieties to facilitate the production of hybrid seed.

3141 *Mackinney, G. Biochemical studies on the inheritance of carotenoid differences in the tomato.* (*pp. 345–52*).

The red-fruited forms of *Lycopersicon esculentum* and *L. pimpinellifolium* contain primarily all-trans-lycopene, together with small quantities of β-carotene and phytofluene, and have the genotypic formula *RRTTAtAtbb*. *R* controls the total quantity of carotenoid produced and *T* the quantity and configuration of the lycopene synthesized. Thus fruits of the genotype *RRtt* synthesize as much total carotenoid as *RRTT* but less lycopene is synthesized and it is mainly in the poly-cis-form. The yellow-tangerine double recessive, *rrttAtAt*, contains chiefly prolycopene and both the yellow-apricot, *ttTTatatbb*, and the tangerine-apricot, *RRttatatbb* forms are characterized by the complete absence of all-trans-lycopene, although the latter synthesizes a small quantity of poly-cis-lycopene. There appears to be no effective *R* locus in *L. hirsutum* and anomalous results have been obtained in crosses with various forms of *L. esculentum*. The *B* locus in *L. hirsutum* affects the total quantity of β-carotene produced, small quantities being synthesized when the double recessive is present, but the synthesis of β-carotene is also dependent upon dominance at the *R*, *T*, and *At* loci. (Cf. *PBA*, XXIII, Abst. 741, and XXVI, Abst. 1884).

3142 *La Rotonda, C. I problemi tecnologici dell'industria conserviera ed il miglioramento genetico del pomodoro.* (*The technological problems of the canning industry and the genetic improvement of the tomato*). (*pp. 353–70*).

The merits of the variety San Marzano for peeling are elucidated. This variety has become very mixed and often entirely replaced by other varieties, also with cylindrical fruits but of inferior quality, such as Lampadina. Work carried out since 1950 at the University of Naples indicates that it should be possible by selection to recover a variety with all the merits of the original San Marzano. For sauce, varieties characterized by good colour, high sugar and low acid content are required and in these respects the cultivar Re Umberto [King Humbert] excelled all others, with 53% of sugars (expressed as glucose) and 6·1% acidity (expressed as monohydrous citric acid).

3143 *Manunta, C. Sulla selezione di pomodori ad alto contenuto in vitamine.* (*The selection of tomatoes with high vitamin content*). (*pp. 371–76*).

In some of the later generations of crosses between *Lycopersicon esculentum* and *L. hirsutum* it has been possible to select phenotypes combining a lycopene content of up to 16·00 g. % with a β-carotene content of 7–8 g. % and a vitamin C content of 36%. It is thought that, by crossing them with some hybrids of *L. esculentum* x *L. pimpinellifolium* having high contents of sugars and lycopene, still further improvements may be effected.

3144 *Manunta, C. Studio comparativo su vari stipiti di medica con metodo cromatografico su carta.* (*Comparative study on various lines of lucerne by the method of paper chromatography*). (*pp. 377–84*).

No significant differences in content of phytoxanthine were observed in the seeds of nine different strains of lucerne, nor were differences in the pigment content of the leaves or flowers detected.

3145 *Tirelli, M. E possibile combattere la mosca delle olive con mezzi genetici?* (*Is it possible to combat the olive fly by genetical means?*) (*pp. 385–92*).

Details are given of the reactions of 23 varieties

of olive to *Dacus oleae* and it is pointed out that varieties which suffer fewer attacks, such as Leccino and Moraiolo [Mulberry], have small, dry fruits, while those with large juicy fruits are readily attacked by the fly.

3146 *Dionigi, A. I frumenti del meridione. (The wheats of the south). (pp. 397–404).*

The advantage of the so-called late-early biotype (cf. *PBA*, XXVI, Abst. 3160) is propounded once more. In southern Italy many of the bread wheats and all the *Triticum durum* varieties there belong to the reverse type, the early-late biotype; if they could be converted to the late-early type an important cause of loss of yield from winter injury would be removed. As far as the bread wheats are concerned, this can probably be done by appropriate hybridization, which has been embarked upon. For *T. durum*, in which the late-early biotype seems to be absent altogether, interspecific crosses with bread wheats will be necessary, followed by back crossing, since the early-late cycle of the *T. durum* parent is dominant in the hybrids. A certain variation in the length of the vegetative phase has however been observed in *T. durum*, it being somewhat longer in Cappelli than in Grifoni 235, and a search for further representatives of this type is being made among the local wheats of mountainous regions in Lucania and elsewhere.

3147 Madec, P., Pérennec, P. & Laissus, R. Station Centrale d'Amélioration des Plantes. Laboratoire de recherches sur la pomme de terre, Landerneau. Travaux effectués pendant la période 1945–1955. **(Central Plant Breeding Station. Laboratory for Research on the Potato, Landerneau. Work carried out during the period 1945-55).** Ann. Inst. nat. Rech. agron., Paris : Sér. B. : 1956 : **6** : 319–82.

Varietal differences in yield, starch content and disease resistance are noted and tabulated data are presented on the agronomic characteristics of the principal potato varieties grown in France. *Solanum tuberosum* has been crossed with a number of wild species with a view to transferring genes for resistance to late blight and virus diseases to cultivated varieties. Studies were carried out on tuber formation in the potato (cf. *PBA*, XXV, Abst. 3188) and on varietal differences in the length of the dormant period (cf. *PBA*, XXVI, Abst. 3460).

3148 Constantinescu, E. *et al.* Contribuţii la raionarea soiurilor de cartof. **(Contributions to the regionalization of potato varieties).** Anal. Inst. Cerc. agron. Român. 1954–1955 (1956) : **23** : No. 4 : 203–45.

Details are given on the yield, adaptation, resistance to viruses and starch and protein contents of a series of potato varieties as shown in an extensive series of Rumanian variety trials conducted in 1949–54.

3149 Casquero B., C. G. & Calzada B., J. Estudio comparativo de híbridos y variedades de papa en la zona de Canta. **(Comparative study of hybrids and varieties of potato in the Canta area).** Agronomía, Lima 1956 : **21** : No. 85 : 69–74.

Details are given of the yield, water content, starch content, tuber shape, colour and thickness of the skin, depth of the eyes and texture, flavour and colour of the flesh of 11 commercial varieties and 14 hybrids tested at Canta, Peru; their suitability for different methods of cooking is also indicated.

3150 Hougas, E. W. & Ross, R. W. **The use of foreign introductions in breeding American potato varieties.** Amer. Potato J. 1956 : **33** : 328–39.

A comprehensive review is given of information on the part foreign introductions have played in early and modern breeding in the USA, the varieties released since 1932 and the introductions which entered in their pedigrees being listed in a table. An account of the potential value of recent introductions, including wild *Solanum* species, is also provided.

3151 López Campos, G. Técnica de la hibridación en la patata. **(Technique of hybridization in potatoes).** ASPAS, Madr. 1953 : No. 7 : 11–14.

An account is given of the potato flower, of the floral biology and of the most effective way of performing cross pollination, with indications of the pecularities of certain varieties; thus the variety Sergen (= Ackersegen) is mentioned as a good seed parent but a poor pollen parent.

3152 Wangenheim, K.-H. v. Ursachen von Sterilität und schlechter Kreuzbarkeit bei Kartoffeln. **(Causes of sterility and poor crossability in potatoes).** Z. Pflanzenz. 1956 : **36** : 445–56.

Studies carried out at the Max Planck Institute

for Breeding Research, Köln-Vogelsang, confirmed that external environmental conditions, in particular temperature, exercise a considerable effect on the degree of success or failure of potato crosses. Poor crossability, whether due to genetical or environmental factors, is usually the direct result of physiological disorders at one of several different stages during the reproductive process. Unfavourable conditions of temperature or humidity may affect the physiology of the ♀ plant in such a way that the flowers are shed before fertilization can be effected or gamete formation, pollen-tube growth or endosperm formation may be inhibited if the temperature is too low. Difficulties encountered in crossing cultivated varieties with wild species are usually due to the fact that the latter are diploid; colchicine treatment to induce tetraploidy in wild species has proved useful in such cases. Attempted crosses of Apta and Robusta, as pollen parents, with other cultivated varieties failed although the pollen of these two varieties was well-formed and viable. It is postulated that this failure is due to cytoplasmic factors. Crosses involving Erstling as ♀ parent were also largely unsuccessful as the majority of the ovules in this variety were malformed.

3153 Taguchi, K. & Nishiiri, K.
(The influence of 2,4-D treatment on seed setting in potato varieties).
Tohoku Nogyo Shikenjo Kenkyu Hokoku/Rep. Tohoku agric. Exp. Sta. 1955 : No. 4 : 27–33. [Japanese].

Concentrations of 0·0007–0·0005% of 2,4-D have proved useful in improving the seed set of varietal crosses that are otherwise difficult to effect.

3154 Taguchi, K.
(Studies on breeding the potato by means of interspecific hybridization).
Tohoku Nogyo Shikenjo Kenkyu Hokoku/Rep. Tohoku agric. Exp. Sta. 1955 : No. 4 : 1–26. [Japanese].

Data are given on interspecific crossability between cultivated varieties of *Solanum tuberosum*, a cultivated potato from Peru designated Tayamashu, *S. andigenum*, *S. acaule*, *S. neoantipoviczii* and *S. demissum*. Tables of the agronomic characteristics of back crosses of *S. demissum* f. *atrocyaneum* x *S. tuberosum* to *S. tuberosum* are also included.

3155 Rieman, G. H., Hooker, W. J., Krantz, F. A. & Werner, H. O.
Potato improvement through parental line breeding.
Amer. Potato J. 1956 : **33** : 319–23.

The cooperative project now being carried out in the north-central states of the USA is described. Its primary aim is the development of parental clones homozygous with respect to the genes for various important characters. Such clones are to be obtained by appropriate degrees of inbreeding. By utilizing homozygous clones, instead of heterozygous ones, the magnitude of the task of screening segregates would be reduced. The use of wild *Solanum* species to introduce resistance to diseases, insects, frost and drought into the inbred clones is envisaged. Methods employed by maize breeders to introduce new genes into existing desirable genotypes are to be studied for their applicability in the improvement of potato lines. Procedures of utilizing the parental clones are also to be evaluated.

3156 McDermott, N.
Key for the identification of potato varieties in the field.
School of Agriculture, Sutton Bonington 1957 : Pp. 36.

About 70 varieties commonly grown in England are grouped into 15 sections in this key on the basis of flower and tuber colour, foliage characters and other features, so that they may easily be identified during the growing season.

3157 Hogen, J. A.
De rassenkeuze bij aardappelen in Oost-Duitsland. **(Choice of potato varieties in East Germany).**
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1956 : **13** : 66–67.

Data are presented on the yield, starch content, maturity group and degree of resistance to virus diseases and *Phytophthora infestans* of some of the main potato varieties grown in East Germany.

3158 Vogt
Kartoffelsorten zur Auswahl. **(Choice of potato varieties).**
Mitt. dtsch. LandwGes. 1957 : **72** : 202–05.

Tabulated data are presented on the yields, soil requirements, shape and colour of tuber, starch content and disease resistance of varieties approved for cultivation in Western Germany.

3159 Höppner, E. & Geidel, H.
Ergebnisse der Kartoffel-Sortenprüfungen 1956 des Bundessortenamtes. **(Results of the 1956 potato varietal trials of the Federal Variety Board).**
Kartoffelbau 1957 : **8** : 24–30.

Information is provided on the yield, starch content, maturity group, cooking quality, size

and shape of the tubers, suitability for the industrial extraction of starch and disease resistance of each of the varieties included in the West German list of approved varieties.

3160 Características de algunas variedades de patata. (**Characteristics of some potato varieties**).
ASPAS, Madr. 1952 : No. 6 : p. 24.

Brief descriptions are given of twelve varieties produced at the Estación de Mejora de la Patata [Potato Breeding Station] in Spain by crossing between well-known Spanish or imported varieties.

3161 Cinco variedades creadas por la Estación de Mejora de la Patata. (**Five varieties developed by the Potato Breeding Station**).
ASPAS, Madr. 1954 : No. 11 : 12–13.

The following five varieties are being released by the Potato Breeding Station in Spain. The semiearly variety Ega (Sergen x Stärkereiche [Starchy]) has tubers of acceptable quality with pale, slightly rough skins, numerous eyes and light yellow flesh.
Amboto (Alegría Oro [Golden Joy] x Colorada de Lugo [Lugo Red]) has round, slightly flattened tubers with smooth pink skins, yellow flesh and good quality. The variety is semiearly and gives high yields in fertile soils.
The productive late variety Victor (Basabe x Industrie) has elongate oval tubers, with rather rough red skins, numerous shallow eyes and yellowish white flesh of good quality. It is resistant to blight.
Developed from Blanca de Rama Alta [High Branched White] x Alegría Oro, Goya is a highly productive, very late variety, highly resistant to blight; it has yellow-fleshed tubers of acceptable quality.
Mari, a yellow-fleshed, pink-skinned semilate variety of the same parentage as Goya, yields large oval tubers of fine quality.

3162 Aardappels, 1957 (observatieproefvelden). [**Potatoes, 1957 (observation experimental fields)**].
Landbouwvoorlichting 14 : Bijl. 7; Ber. Rassenkeuze 1957 : No. 224 : Pp. 4.

Brief information on yield, maturity, quality, dry matter percentage and disease resistance is provided for some of the main varieties grown in the Netherlands, as well as for a number of new varieties undergoing preliminary trials and several introductions from abroad.

3163 Aardappels, 1957 (interprovinciale proefvelden). [**Potatoes, 1957 (interprovincial experimental fields)**].
Landbouwvoorlichting 14 : Bijl. 8; Ber. Rassenkeuze 1957 : No. 225 : Pp. 6.

Data on maturity, starch and dry matter contents, yield per ha., disease resistance and size, shape and quality of the tubers are presented for the more important varieties cultivated in the Netherlands for home consumption and export and for fodder and industrial purposes.

3164 Zwanzigster Tätigkeitsbericht der Vereinigung Schweiz. Versuchs- und Vermittlungsstellen für Saatkartoffeln (V.S.V.V.S.) vom 1. November 1955 bis 31. Oktober 1956. [**Twentieth report on the activities of the Association of Swiss Experimental Stations and Distributive Agencies for Seed Potatoes (VSVVS) from 1 November 1956 to 31 October 1956**].
Basel 1956 : Pp. 32.

This report describes the potato-growing industry in Switzerland and includes descriptions of the varieties most widely grown in that country.

3165 Haynes, F. L., Stevenson, F. J., Akeley, R. V. & Cochran, F. D.
Boone. A new variety of potato resistant to late blight and adapted to western North Carolina.
Amer. Potato J. 1956 : **33** : 315–18.

The late-maturing, high-yielding variety Boone produces medium-oblong, smooth and shallow-eyed tubers which do not sprout until late spring. It is highly resistant to the common race of late blight. Its complex parentage involves *Solanum fendleri* x *S. demissum*, Silhonetto, Katahdin, Earlaine and several seedlings.

3166 Viirsoo, E. V.
El valor amiláceo de las papas autóctonas de Bolivia y Perú. (**The starch content of the native potatoes of Bolivia and Peru**).
Rev. agron. Noroest. argent. 1956 : **2** : 197–24.

Data on starch content, specific weight, place of origin and altitude are given for 561 samples of varieties of *Solanum andigenum* and wild species collected in Bolivia and Peru. The average starch content for all samples was 25·47%, 8·9% of them containing more than 30%. The Peruvian samples were generally

richer in starch than the Bolivian, the highest starch content of 33·2% being found in the Peruvian potatoes Chaquillos de Pomacanchi and Pucamama.

3167 López Campos, G.
Historia y leyenda de la introducción de la patata en Europa. (**History and legend of the introduction of the potato into Europe**).
ASPAS, Madr. 1956 : No. 19 : 5–9.

Some misapprehensions concerning the introduction of the potato into Europe are corrected on the basis of the writings of Salaman (cf. *PBA*, XIX, p. 928) and others.

3168 Gottschalk, W. & Peters, N.
Weitere Untersuchungen über die Morphologie der Pachytänchromosomen tuberarer *Solanum*-Arten. (**Further studies on the morphology of the pachytene chromosomes of tuberiferous *Solanum* species**).
Z. Pflanzenz. 1956 : **36** : 421–33.

The chromosome morphology of *S. canasense* and *S. polytrichon* and of two provenance types each of *S. sparsipilum* and *S. multidissectum* was studied at pachytene in the pollen mother cells and plates illustrating the morphology of the chromosomes and tabulated data on chromosome length are provided. The genome of *S. canasense* was found to have the highest heterochromatin content of all the wild potato species so far studied by the authors and the chromosomes, in particular the satellited chromosomes, differed markedly in their structure from those of the other species studied. Of the 24 chromosomes present in *S. polytrichon*, only 9 could be identified with those of other species within the section *Longipedicellata*; in addition, the large heterochromomeres characteristic of this section were not found in *S. polytrichon* and pronounced nuclear clumping was observed. Of the 12 chromosomes of *S. sparsipilum*, a species closely related to the cultivated potato, 9 could be identified as similar morphologically to the corresponding chromosomes in *S. tuberosum* and *S. andigenum*. Two chromosomes in *S. multidissectum*, numbers 14 and 18, were homologous with chromosomes found both in *S. ajanhuiri* and *S. simplicifolium* and one, number 13, was homologous with a chromosome that is also present in *S. stenotomum*, *S. goniocalyx* and *S. simplicifolium*. No significant differences were noted as regards chromosome morphology between the two different provenance types of *S. sparsipilum* and *S. multidissectum*. A study of these two species, both of which have $n = 12$, suggests that they are tetraploids and therefore that the basic chromosome number of the genus *Solanum* is $x = 6$.

3169 Sawamura, S.
(**Cytological studies on the potato. I. The somatic chromosomes of the diploid sort Tayama and their behaviour during meiosis**).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1952 : **65** : 27–33. [Japanese].

The idiogram of the above diploid variety ($2n = 24$) is described. Various irregularities at meiosis are regarded as evidence of hybridity.

3170 Wangenheim, K.-H. v., Frandsen, N. O. & Ross, H.
Über neue Ergebnisse zur Cytologie und verwandte Fragen bei *Solanum*. (**On new results on the cytology of *Solanum* and related questions**).
Z. Pflanzenz. 1957 : **37** : 41–76.

Recent research on the cytology and genetics of *Solanum* spp. is summarized on the basis of works published on the subject during the period 1950–56. Sections are included on (1) interspecific crossability and causes of infertility in certain crosses, including inhibition of pollen-tube growth and seed abortion, (2) genome differentiation and hybrid sterility in diploid and polyploid crosses and meiosis in hybrids and experimentally produced polyploids, (3) the cytogenetical relationship of *S. tuberosum* to the other species of *Solanum*, the results of interspecific crosses involving *S. tuberosum* and the putative origin of this species, (4) the role played by cytoplasmic inheritance in interspecific *Solanum* crosses, (5) chromosome numbers, chromosome morphology and the problem of the basic chromosome number in the genus *Solanum*, (6) the phylogeny and systematics of the Solanaceae and (7) the transfer of genes from wild species to cultivated varieties. A comprehensive bibliography, providing some 150 references, is included.

3171 Steineck, O. & Czeika, G.
Zellteilung, Zellstreckung und endomitotische Polyploidisierung bei Kartoffeln. (**Cell division, cell extension and endomitotic polyploidization in potatoes**).
Züchter 1956 : **26** : 346–51.

The occurrence and distribution of endopolyploid nuclei and cells in the pith of the vegetative shoots of a number of potato varieties were investigated and varietal differences in the lengths of the zones of diploid and tetraploid divisions were studied. Cell extension was more

pronounced in varieties such as Frühbote [Early Messenger], Sommerkrone [Summer Crown] and Doré [Golden] that do not flower readily under normal day lengths and in these varieties the zone containing endopolyploid cells began shortly below the growing point of the shoot. In the varieties Sieglinde, Mittelfrühe [Medium Early] and Maritta, all of which flower readily under normal day-lengths, cell extension was less pronounced, the zone of diploid cell division was longer and the endopolyploid zone was further away from the growing point. It is therefore suggested that an association exists between the length of the zone of diploid division in a given variety and the ability of this variety to produce flowers under normal day-lengths.

3172 Heimerdinger, W. & Sengbusch, R. von
Stärkewaage für züchterische Zwecke. **(A starch balance for breeding purposes).**
Züchter 1956 : **26** : 370–72.

The apparatus described was invented at the Max Planck Institute for Breeding Research, Hamburg-Volksdorf, and measures the starch content of potatoes by determining their specific weight.

3173 Zubeldia, A.
Hablemos nuevamente sobre la calidad culinaria de la patata. **(Let us talk once more about culinary quality of potatoes).**
ASPAS, Madr. 1956 : No. 20 : 5–6.

The view is expressed that there is room on the Spanish market for both varieties of high quality and varieties of high yielding ability with only passable quality. Reference is made to some clones of excellent quality selected by the Estación de Mejora de la Patata [Potato Breeding Station].

3174 Schober, K.
"Domino" und "Karo" auf dem Kartoffelmarkt. **(Domino and Karo on the potato market).**
Landwirtschaft 1957 : No. 1 : 3–5.

The above new Austrian potato varieties are distinguished by their high yields and high starch contents and are intended primarily for the industrial extraction of starch and for fattening pigs. In recent trials their yields of starch per given area have been up to 15% higher than those of Ackersegen and have also been superior to those of the industrial variety Maritta.

3175 Danert, S.
Zur Systematik von *Solanum tuberosum* L. **(On the systematics of *S. tuberosum* L.).**
Kulturpflanze, Berlin 1956 : No. 4 : 83–129.

A system of classification of cultivated varieties of *S. tuberosum* on the basis of the colour of the skin and flesh of the tuber, the colour of the flower and the morphology of the leaves is outlined, the author being of the opinion that a classification according to origin or ancestry is impossible owing to the complicated genetical background of present-day varieties. Of the five convarieties proposed, convars. *tuberosum, rubrum, violaceum, bicolor* and *fragariinum*, the first three each comprise eight botanical varieties, convar. *bicolor* has two and convar. *fragariinum* six. The author disputes the view, held by some potato geneticists, that *S. tuberosum* can be divided into two separate subspecies and also, in his introductory remarks on the systematics of the genus *Solanum*, suggests that there are insufficient grounds for according *Basarthrum* and *Hyperbasarthrum* sectional status, preferring to consider them as subsections of the section *Tuberarium*.

3176 Cárdenas, M.
Estudio de los grupos taxonómicos de las papas silvestres. **(Study of the taxonomic groups of the wild potatoes).**
Turrialba 1956 : **6** : 59–66.

An outline is given of the taxonomy of the genus *Solanum*, pointing out that many of the series established in the past are of very doubtful taxonomic validity, as are many of the species. The opinion is expressed that much material in South America remains still unknown, especially in extreme climatic conditions such as those of Bolivia, where species such as *S. cuevoanum* and *S. caipipendense* grow at 600 m. and other species such as *S. achacachense* grow at 4000 m. and more. Some other Bolivian species thought to be of interest for breeding purposes include *S. violaceimarmoratum*, which grows at heights of 1000–2000 m.; *S. brevicaule* and *S. toralapanum* which grow at 4000 m., and have been crossed with the diploid species *S. cardenasii*; *S. candolleanum* and *S. cevallos-tovari*, growing in cold damp habitats; *S. simplicifolium*, resistant to virus X and Y; *S. higueranum*, *S. xerophyllum* and a number of others growing in excessively dry places; *S. circaeifolium* and *S. capsicibaccatum*, which are resistant to *Phytophthora infestans*; *S. acaule* and a related species *S. uyunensis*, resistant to frost; *S. commersonii* and

S. chacoense, resistant to scab and various virus diseases and insects, including *Epitrix* which is a serious pest in Bolivia; *S. caipipendense* in which the tubers will keep for up to a year without sprouting; *S. arnezii* which possesses a high degree of virus resistance in the field; and *S. andigenum* which is resistant to leaf roll and various other diseases.

3177 Börger, H., Huhnke, W., Köhler, D., Schwanitz, F. & Sengbusch, R. von
Untersuchungen über die Ursachen der Leistung von Kulturpflanzen. I. Das Verhalten der Komponenten des Stärkeertrages von Kartoffeln. (**Studies on the causes of yield in crop plants. I. The behaviour of the components of starch yield in potatoes**).
Züchter 1956 : **26** : 363–70.

When varieties with a low starch content or small tubers were grafted on to varieties with a high starch content or large tubers, and *vice versa*, the starch content and size of the tubers produced were invariably determined by the genetical constitution of the stock, the effect of the scion being negligible. The experiments were inconclusive as regards the effect of the scion upon the number of tubers produced. Grafts of tomato upon potato did not affect either the starch content or the size of the tubers to any appreciable extent. The experiments indicate that the assimilatory surface of the foliage of potatoes appears to be considerably in excess of the area needed to produce the raw materials that the plant requires and that the actual tuber and starch yields depend upon the genetically-determined capacity of the tubers to absorb and store this material.

3178 López Campos, G.
Labor del Max-Planck-Institut de Voldagsen en la obtención de variedades de patata resistentes a enfermedades y plagas. (**The work of the Max Planck Institute at Voldagsen in producing potato varieties resistant to diseases and pests**).
ASPAS, Madr. 1953 : No. 10 : 3–7.

After a general description of the work of this German research station, a more detailed account is presented of the potato breeding, special mention being made of breeding for resistance to leaf roll and other virus diseases, using as parents *Solanum acaule*, *S. andigenum* and the varieties Aquila and Shamrock; forms resistant to drought have appeared in crosses of *S. andigenum*; the varieties Fortuna and Norma are possessed of hypersensitivity to all strains of virus X; certain hybrids of *S. andigenum* are resistant to all existing strains of *Phytophthora infestans* and of *Alternaria solani*; and *S. demissum* and *S. chacoense* are being used in breeding for resistance to Colorado beetle.

3179 Klinkowski, M.
Probleme der Kartoffelpathologie. (**Problems in potato pathology**).
SB dtsch. Akad. LandwWiss. Berl. 1956 : **5** : No. 15 : Pp. 17.

The occurrence of new physiological races of late blight, the discovery of new virus diseases such as bouquet and virus S and the value of wild species in transferring genes for resistance to virus and other diseases are among the subjects discussed in this general account of pathological conditions encountered in the potato.

3180 Świeżyński, K.
Prosta metoda określania mrozoodporności ziemniaków. (**A simple method of determining frost resistance in potatoes**).
Roczn. Nauk rol. : Ser. A. : 1956 : **73** : 391–99.

Leaf samples of the material to be tested are placed in sealed test tubes which are then immersed in a saline solution maintained at a desired temperature below freezing point. The degree of resistance is assessed according to the discoloration, lack of turgidity and glassy appearance of the leaves. In tests involving two resistant lines of *Solanum acaule*, seven moderately resistant lines from *S. demissum*, *S. yabari*, *S. stenotomum* and *S. ajanhuri*, and 21 susceptible lines of *S. tuberosum*, the greatest differences between the three resistance groups were obtained after 4–8 hours at —2·5° C.

3181 Mastenbroek, C.
Some experiences in breeding frost-tolerant potatoes.
Euphytica, Wageningen 1956 : **5** : 289–97.

In an attempt to develop potato varieties with improved resistance to frost, crosses have been made among *Solanum acaule*, *S. tuberosum*, *S. demissum*, *S. macolae* and *S. simplicifolium*. Details are given of the effect of low temperatures on progeny of (*S. acaule* 'Bukasov' x *S. acaule* 'Recoba') x (*S. demissum* x *S. tuberosum*), (*S. demissum* x *S. simplicifolium*) x *S. tuberosum* and (*S. macolae* x *S. simplicifolium*) x *S. tuberosum* and on some back-cross seedlings. Several seedlings were promising in respect of frost tolerance and it has been shown that at least some of the resistance possessed by *S. acaule* can be transferred to the second back cross generation although the mode of inheritance is not yet known. Frost-resistant selections are

variable in respect of morphological and agronomic characters but linkage of resistance with undesirable characters of *S. acaule* does not seem to be present.

3182 Tomiyama, K.
(Cytological studies on resistance to potato blight. II. The relation between changes in the host cell and the vitality of the invading hyphae).
Nihon Shokubutsubyorigaku Kai Ho/Ann. phytopath. Soc. Japan 1955 : **19** : 149–54.

Further to the research summarized in *PBA*, XXV, Abst. 2171, the author reports the results of microscopic investigations into hyphal growth in the highly resistant variety 41089–8. Hyphal growth appears to be inhibited by the active response of the invaded cells, possibly through gelation of the cell contents and increased formation of phenolic and nitrogenous substances.

Thirty-seventh report of the Quebec Society for the Protection of Plants.
1955 : Pp. 161.

3183 *Campagna, E. Étude de la résistance de soixante variétés de pommes de terre au mildiou* (Phytophthora infestans) *dans la région de Ste-Anne-de-la-Pocatière en 1954. (Study of the resistance of sixty potato varieties to blight in the region of Ste-Anne-de-la-Pocatière in 1954). (pp. 47–63).*

Data are presented on the reaction of 64 potato varieties to *Phytophthora infestans* at the above station in Quebec province, Canada. Calrose, Arran Victory, Sebago and Ontario proved the most resistant.

3184 *Généreux, H. Observations en 1954 sur les variétés de pommes de terre résistantes au mildiou. (Observations in 1954 on potato varieties resistant to blight). (pp. 85–87).*

The results of observations on the incidence of *Phytophthora infestans* in different parts of Quebec province are summarized and varietal differences in reaction are noted.

3185 Zubeldia, A.
La obtención de variedades de patata resistentes al mildiú (*Phytophthora infestans*). [**Production of potato varieties resistant to blight (*Ph. infestans*)**].
ASPAS, Madr. 1953 : No. 8 : 12–14; 1954 : No. 13 : 2–6; 1955 : No. 15 : 10–12.

Reference is made to the work of Black (cf. *PBA*, XXVI, Abst. 1407) and a list is given of British, German and American varieties said to be resistant to *Phytophthora infestans*, special mention being made of the resistance of Pentland Ace to strains A, B and C.

In part II the problem of biotypes and the nature of resistance are discussed, the value of resistance to incubation as opposed to hypersensitivity is explained and the extreme complications resulting from the use of hypersensitivity derived from *Solanum demissum* are illustrated by examples. Some more details are given concerning methods of testing seedlings and tests of species and varieties possessed of resistance to incubation or of hypersensitivity are presented.

Part III provides further grounds for directing breeding towards resistance to incubation, alone or in conjunction with hypersensitivity, and for regarding *S. andigenum* as the most promising source of resistance not only to blight but to *Spongospora subterranea*, viruses A, X, B, C and leaf roll, nematodes, frost and drought.

3186 Mills, W. R., Niederhauser, J. S. & Hougas, R. W.
Blight resistance of selected *Solanum* hybrids in Mexico.
Phytopathology 1957 : **47** : p. 25. (Abst.).

Crosses have been made between clones of hexaploid *S. demissum* selected for high resistance to *Phytophthora infestans* and 15 susceptible diploid *Solanum* species and the F_1 hybrids crossed to *S. tuberosum* 'Katahdin' and *S. stoloniferum*. High resistance to *P. infestans* was found in 66 of the F_1 selections and in back crosses to *S. stoloniferum*, in several of which the resistance of the progeny was greater than that of the parents.

3187 Krotova, O. A.
(Potatoes for Sahalin).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1956 : No. 12 : 11–13. [Russian].

Sejanec 6–103 [Seedling 6–103], Sejanec 7–585 and Gibrid Kameraza 1 [Kameraz Hybrid 1], which are introductions from the Institute of Plant Industry, outyield all other varieties cultivated in Sahalin. They are notable for good transportability and resistance to *Phytophthora* and *Synchytrium*.

3188 Thurston, H. D., Eide, C. J. & Knutson, K.
The effect of location and races on the epidemiology of *Phytophthora infestans*.
Phytopathology 1957 : **47** : p. 35. (Abst.).

Race 0 of *Ph. infestans* was found to spread more

rapidly from a single inoculated plant through a plot of potatoes than did race 1, suggesting that it may be the more aggressive of the two races.

3189 Toxopeus, H. J.
Reflections on the origin of new physiologic races in *Phytophthora infestans* and the breeding for resistance in potatoes.
Euphytica, Wageningen 1956 : **5** : 221–37.

Among the points considered are the following: (1) since there is a close correlation between time of maturity and field resistance the mechanism of inheritance of these characters should be the subject of further investigation, (2) the breeding of first and second early varieties possessing *R* genes is recommended since epidemics of the fungus can only occur as a result of the building up of sources of infection in varieties without *R* genes, (3) the development of new strains of the parasite depends to a large extent on the varietal composition of the potato crop, the presence of a susceptible variety preventing the adaptation of the fungus to the more resistant ones, (4) tuber resistance, and the correlation between tuber and leaf resistance should receive further study since diseased tubers may provide a source of infection already adapted to the variety being planted and (5) it is suggested that each *R* gene in the host is counteracted by a pathogenicity gene (*p* gene) in the fungus and the origin of new races thus depends on the origin of the different *p* genes and their combinations. The frequency of occurrence of the *p* genes varies, *p*4 being the most frequent in western Europe.

3190 Tomiyama, K., Takase, N., Sakai, R. & Takakawa, M.
(Physiological studies on the resistance reaction of the potato to infection by blight. II. The physiological reaction of potato tubers to infection by blight strains of differing pathogenicity).
Nihon Shokubutsubyorigaku Kai Ho/Ann. phytopath. Soc. Japan 1955 : **20** : 59–64. [Japanese].

The resistance of Hokkai 10 to strains H_1 and H_2 of *Phytophthora infestans* is associated with a marked increase in water-soluble protein and polyphenols after infection.

3191 Ylimäki, A.
Perunasyövän levinneisyys ja torjunta suomessa. **(The spread of wart disease of potatoes and its arrest in Finland).**
Maataloust. Aikakausk. 1955 : **27** : 199–220.

This detailed survey of the incidence of wart disease in Finland during the last 30 years includes a survey of progress in obtaining resistant varieties and of the extent to which these are grown.

3192 Quevedo Díaz, A., Simón, J. E. & Toxopeus, H. J.
Estudios de resistencia a la "anguilula dorada" (*Heterodera rostochiensis*). [**Studies on resistance to the golden eelworm (*H. rostochiensis*)**].
Bol. trimestr. Exp. agropec., Progr. Coop. Exp. Agropec., Lima 1956 : **5** : No. 1 : 18–24.

This work has been referred to in Abst. 1937.

3193 López Campos, G.
Posibilidades en la obtención de variedades de patata resistentes al nemátodo dorado (*H. rostochiensis*). [**Possibilities of producing potato varieties resistant to root eelworm (*H. rostochiensis*)**].
ASPAS, Madr. 1954 : No. 14 : 5–9.

After an account of the biology of *Heterodera rostochiensis*, it is suggested that Andean potato varieties and species are probably tolerant and may provide valuable material in breeding for resistance since, although the pest is widely prevalent in the Andes, potato crops there appear to suffer little damage.

3194 Alfieri, S. A. & Stouffer, R. F.
Evidence of immunity from virus S in the potato variety Saco.
Phytopathology 1957 : **47** : p. 1. (Abst.).

No evidence of the presence of potato virus S was found in any plant of Saco examined, nor could infection of this variety with virus S be established by grafting or inoculation.

3195 Seiffert, M.
Die Bedeutung der Züchtung für die Ertragssteigerung im Kartoffelbau in den letzten 5 Jahrzehnten—ein Beitrag zur Methodik der Ermittlung des züchterischen Fortschrittes. **(The importance of breeding for increased yields in potato cultivation in the last five decades—a contribution to the procedure of determining progress in breeding).**
Züchter 1957 : **27** : 1–22.

Data compiled from official German sources are presented to show that the average yield of potatoes per ha. in Germany rose by 64% over the period 1900–1950. Most of this increase, however, was due to improved cultural methods and the use of artificial fertilizers, only about one sixth of the total increase being attributable

to the cultivation of new varieties. The main reason for new varieties not giving higher yields has been that after a time they become infected with virus. However, new virus-resistant varieties that are now being developed in Germany should help to overcome this problem and may result in further yield increases of up to 50% per hectare.

3196 Baerecke, M.-L.
Ergebnisse der Resistenzzüchtung gegen das Blattrollvirus der Kartoffel. 1. Mitteilung. (Results of breeding for resistance to the leaf roll virus of potato. Part I).
Z. Pflanzenz. 1956 : **36** : 395–412.

Interspecific crosses carried out between clones of *Solanum andigenum*, *S. acaule* and *S. demissum* selected for their field resistance to the leaf roll virus gave F_1 generations containing an average of 9% of resistant plants whereas selfing or interclonal hybridization within the same species resulted in only 2% resistant plants. When the resistant F_1 interspecific hybrids were further crossed *inter se*, up to 40% resistant plants were obtained, the average being 18%. On the basis of these results it is concluded that resistance to leaf roll is determined by a series of polygenes; a few comparatively resistant F_1 plants were obtained from crosses between the original resistant clones of the three wild species mentioned and susceptible cultivated varieties, thus indicating that some of the genes for resistance are inherited as dominants.

3197 Suhov, K. S. & Kapica, O. S.
(Directed variability of potato virus X after mixed inoculation with tobacco mosaic virus).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. : 1956 : No. 3 : 53–64. also Trud. Inst. Genet. (Trans. Inst. Genet.) 1956 : No. 23 : 283–95. [Russian].

Potato virus X_2 changed into the X_3 strain after it had been cultured together with a tobacco mosaic strain pathogenic to *Cyphomandra* upon *Nicotiana tabacum*, *N. glutinosa*, tomato and *Datura* at Gorki Leninskie.

3198 Hirai, T., Yasumi, T. & Kato, H.
(Strains of potato virus Y).
Tohoku Nogyo Shikenjo Kenkyu Hokoku/Rep. Tohoku agric. Exp. Sta. 1955 : No. 4 : 73–86. [Japanese].

A series of different strains isolated from Japanese potatoes are distinguished on the basis of the symptoms produced on four differential hosts.

3199 Perigua, M. T.
Maturity periods of selected Miller's seedling clones of sweet potato in the wet season.
Philipp. Agric. 1954 : **38** : 116–32.

Clonal seedlings developed by J. Miller at Louisiana State University were tested at the Central Experiment Station, Laguna, Philippines. Information is given on the times of maturity, tuber yield, quality and other characters of the seedlings.

3200 Iura, M., Chuman, K., Marumine, S., Shirasaka, S. & Sakai, K.
(On the new sweet-potato variety Benisengan).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1956 : **3** : 421–27. [Japanese].

A full description is given of the above variety, of which a preliminary report was summarized in *PBA*, XXVI, Abst. 2074.

3201 Martin, W. J.
Three genetic abnormalities in the sweetpotato variety Porto Rico.
Phytopathology 1957 : **47** : p. 23. (Abst.).

Attempts in Louisiana to transmit leaf variegation, leaf crinkling and leaf cupping from three abnormal clones to normal sweet potato plants by grafting have failed, suggesting that the abnormalities are genetically controlled rather than the result of virus infection.

3202 Kantzes, J. G.
Susceptibility of a number of sweetpotato varieties and selections to infection by *Monilochaetes infuscans*.
Phytopathology 1957 : **47** : p. 19. (Abst.).

None of the varieties or selections tested were immune to infection by any of 13 isolates of *M. infuscans*, although differences in severity of infection were observed.

FIBRES

3203 Gorškov, P. A.
(Some results and prospects of scientific research on fibre plants).
Lën i Konoplja (Flax & Hemp) 1957 : No. 3 : 38–40. [Russian].

This report deals with breeding work at the USSR Institute of Fibre Plants and its branch stations.

Hemp. Central Russian and southern biotypes of monecious hemp have been obtained. The former yields more fibre but less seed than

the standard Novgorod-Severšk and more seed but less fibre than JuS1. The new southern monecious biotype has similar economic characteristics to Krasnodar. A series of new diecious varieties have been made standards in Russia, Siberia, White Russia and the Ukraine. Gluhov 1, the new standard for White Russia, is early and productive of fibre and seed.

Kenaf. The new varieties, Kubanj 333 and 3876, from the north Caucasus outyield the standard 21. The yield increases are 25–62% and 25–36% respectively. Breeding forms with glabrous and spineless capsules, stems and leaves is mentioned.

3204 Veliev, I.
(The new Soviet cotton variety 2421 in the Azerbaijan SSR).
Hlopkovodstvo (Cott.-raising) 1957 : No. 1 : 46–51. [Russian].

The variety 2421 (1036 x 108F) combines the earliness of the ♀ parent with the high yield and fine quality of fibre of the ♂ parent. It has a somewhat longer growth period than 1298, but ripens more uniformly, has a larger boll and produces high yields of cotton before the onset of frost. It has a habit suitable for combine harvesting.

3205 Aleksandrov, A.
(The breeding and seed growing of cotton in the Chinese People's Republic).
Hlopkovodstvo (Cott.-raising) 1957 : No. 1 : 56–61. [Russian].

This report on breeding work at Nanking and other research institutes describes new varieties notable for high yield, earliness, low position of sympodia, large bolls, good length and strength of fibre, resistance to pests and diseases and high ginning percentage. Some of these were obtained by selection, others by hybridization, including interspecific crossing between *Gossypium barbadense* and *G. arboreum*, on the one hand, and *G. hirsutum*, on the other. The incompatibility between the components of the second cross was overcome by supplementary fertilization by self pollen 8 hr. after cross pollination. Other agrobiological methods used for improvement of fertility in interspecific hybrids included treatment of the emasculated flowers with 38% sucrose solution + vitamin B_1. Experiments on exploitation of heterosis are reported from the Kaiyuan Cotton Research Station, Yunnan, where hybrids between perennial and annual cottons characterized by high yields and long fibre of good quality were obtained. It is stated that heterosis was maintained for several generations.

3206 Negi, L. S. & Singh, A.
Improved strains of Punjab American cotton.
Indian Cott. Gr. Rev. 1956 : **10** : 225–31.

The development of improved strains of American Upland cotton by the Cotton Research Station at Hansi for use in the Punjab is briefly reviewed and a detailed description is given of 216F, a reselection from M4. Selected originally at Lyallpur it gave good results at Hansi and was released in 1948. It is superior to M60A2 in respect of yield and fibre characters.

3207 Rodríguez, J. P. & Martorell, L. F.
El cultivo del algodón en Puerto Rico. (**The cultivation of cotton in Puerto Rico**).
Bol. Estac. exp. agríc. Puerto Rico 1956 : No. 131 : Pp. 102.

The report includes a brief account of the results of trials of some of the main introduced or locally developed varieties of Sea Island cotton studied at the Puerto Rico Agricultural Experimental Station since 1928 (cf. *PBA*, XXVI, Abst. 3525).

3208 Cava Castillo, E.
Estudio estadístico de la bellota y fibra de ocho selecciones de algodón en siete valles. (**Statistical study of the bolls and fibre of eight cotton selections in seven valleys**).
Agronomía, Lima 1956 : **22** : No. 86 : 101–06.

Details are given of the yield, fibre percentage, fibre length and weight of crude cotton per boll of eight selections tested over two years as both first-year and ratoon crop in seven different valleys in Peru. The most productive and widely adapted strains were LM117–38 and LM7–35.

3209 Rajaraman, S. & Nanjundayya, C.
Variation of certain fibre properties with group-lengths of a cotton with special reference to Pressley strength index.
Indian Cott. Gr. Rev. 1956 : **10** : 236–42.

Data are provided on the mean fibre length, Pressley strength index, individual fibre strength, mean fibre weight per unit length, intrinsic fibre strength and percentage of mature fibres of 13 Indian cotton varieties.

3210 Kalyanaraman, S. M., Santhanam, V. & Ramchandran, K.
Inheritance and inter-relation of mutant genes affecting lint length and fibre maturity in *G. arboreum*.
Indian Cott. Gr. Rev. 1956 : **10** : 243–52.

Studies of F_1, F_2 and back-cross progeny of

CST–1 x CST–4 have shown that both halo length and fibre maturity are monogenically determined and are not linked. However the recessive gene l_m, derived from CST–4, is thought to have a pleiotropic effect on halo length since this strain has a lower mean halo length than do other strains of Cocanadas cotton. Both CST–1 and CST–4 have a low lint index but F_1 progeny were found to have a higher mean index than either parent. It is suggested that this is due to a complementary effect of "normal length" from CST–4 and high fibre maturity from CST–1. The presence of minor genes affecting fibre maturity, in addition to L_m, is suggested.

3211 Gerstel, D. U.
The use of segregation ratios of synthetic allopolyploids as a taxonomic tool.
J. Elisha Mitchell sci. Soc. 1956 : **72** : p. 193. (Abst.).

Attention is drawn to the value of the degree of preferential association between homologous chromosomes of the parental species in synthetic allopolyploids of *Gossypium* as an indication of taxonomic affinities. The following results, for instance, support the hypothesis of Stephens, based upon morphogenetic evidence, that *G. raimondii* is more closely related to *G. hirsutum* than is *G. thurberi*. The gametic ratio in *G. hirsutum* - *G. raimondii* amphidiploids varied between 8·3 : 1 and 12 : 1 (5 loci) whereas that in *G. hirsutum* - *G. thurberi* amphidiploids ranged from 24·3 : 1 to 47·0 : 1 (2 loci).

3212 Bhat, N. R. & Patel, C. T.
Some new strains of cotton evolved through interspecific hybridization at Surat.
Indian Cott. Gr. Rev. 1956 : **10** : 218–24.

Several promising new strains derived from interspecific hybrids are described, with details of their performance over one or more seasons. A back-cross selection, 134–Co2–M, which is resistant to jassids and *Xanthomonas malvacearum* has done well on light soils in Gujarat. Three selections from BC68, with the same resistance and good economic characters, have done well at Surat, as has BC68 x 22. Some selections from 170–Co2 (Co2 x 1027ALF) F_1–D, a hexaploid which has reverted to the tetraploid condition, are early maturing and may prove suitable for arid regions. Resistance to jassids and thrips has been shown by selections from *Gossypium hirsutum* x *G. tomentosum* and these selections have given good yields under arid conditions at Indore. Hybrids between *G. hirsutum* and *G. barbadense* are promising in respect of resistance to jassids and *X. malvacearum* and of lint characters and further selection will be carried out.

3213 Gerstel, D. U. & Sarvella, P. A.
Additional observations on chromosomal translocations in cotton hybrids.
Evolution, NY 1956 : **10** : 408–14.

Previous investigations on chromosomal arrangements in Old World cottons were extended to include races *indicum* and *sudanensis* of *G. arboreum*, with the result that all representatives of this species so far tested are now known to be structurally similar and to differ from *G. herbaceum* by one major segmental interchange. *G. barbadense*, *G. hirsutum* and *G. tomentosum* were not found to differ by any segmental interchange involving a major portion of a chromosome arm. The New World species and *G. herbaceum* are known to have a segmental arrangement in common. As in a previous paper, the author suggests that *G. herbaceum* may be a common ancestor of the three New World species (cf. *PBA*, XXIV, Abst. 1258).

3214 Sarvella, P.
Cytomixis in cotton.
J. Elisha Mitchell sci. Soc. 1956 : **72** : p. 192. (Abst.).

Cytomixis was observed in pollen mother cells of species and interspecific hybrids. It occurred chiefly at late prophase but was observed as late as telophase II. The binucleate cells and cells with deficient or abnormally high chromosome numbers seen at metaphase are believed to have been the result of cytomixis which is in turn ascribed to incomplete wall formation.

3215 **Cotton's good-luck plants.**
Agric. Res., Wash. 1956 : **5** : No. 6 : 8–9.

This popular article describes the use in cotton breeding at Stoneville, Miss., of completely homozygous plants produced by colchicine treatment of maternal haploids. The progeny of a cross between doubled Stoneville haploid Z106 and doubled Deltapine haploid 8948 showed considerably greater hybrid vigour than that shown by normal hybrids.

3216 Iltis, J.
Étude de la floraison et de la capsulaison de quelques variétés de cotonniers à la Station du Tadla (Maroc). [**Study of flowering and boll formation in some cotton varieties at the Tadla station (Morocco)**].
Cot. et Fibr. trop. 1956 : **11** : 23–38.

Information is provided on the date of flowering,

length of period of flowering and date of boll formation, extent of shedding, average weight of boll and number of seeds per boll of Pima 67, Ashmouni and Giza 31, all of which pertain to *Gossypium barbadense*, and Acala 1517C and Acala Rogers, both of which belong to *G. hirsutum*.

3217 Fryxell, P. A.
Effect of varietal mass on percentage of outcrossing.
J. Hered. 1956 : **47** : 299–301.

Two cotton populations differing by a single marker were grown in two fields 630 feet wide lying end to end and the degree of cross pollination occurring at various points in one of the fields was studied. Down the centre of the field, contamination became negligible at about 35 rows from the contaminant field, the row spacing being 3½ feet, but at 150 feet from the edges there was still an appreciable amount of contamination at 50 rows, indicating that degree of crossing was influenced not only by distance from the source of contamination but also by the distance from the perimeter of the stand.

3218 Glavinič [Glavinić], R.
(A cotton hybrid with the characters of two paternal forms).
Izv. Akad. Nauk SSSR (News Acid. Sci. USSR) : Ser. biol. : 1956 : No. 4 : 136–38. [Russian].

Gossypium barbadense 'Maarad' was pollinated with mixed pollen from *G. hirsutum* '78' + *G. herbaceum*. In three out of the four lines obtained, some plants displayed features characteristic of the seed parent and both pollen parents. Thus in line 1 some plants had stem and leaf resembling Maarad, flowers resembling 78 and bolls, seeds and lint like *G. herbaceum*; others had stem, leaf and flower resembling *G. herbaceum*, bolls like 78 and seed and lint like Maarad; one plant resembled 78 in stem, leaf, seed and lint characters, Maarad in flower characters and *G. herbaceum* in boll characters; in line 2 some plants resembled *G. herbaceum* in stem and leaf, 78 in flower and Maarad in boll, seed and lint characters; in line 3 some plants had stem and leaves like 78, flowers like Maarad and bolls, seeds and lint like *G. herbaceum*; others had stem, leaf and flowers like 78 and bolls, seed and lint like *G. herbaceum*; finally in line 4 all plants had characters of Maarad and 78 only, but plants combining characters from both pollen parents appeared in the F_2 generation, as they did in the F_2 from lines 1 to 3.
The control cross of Maarad x 78 resembled Maarad in stem, leaf and flower characters and 78 in boll, seed and lint characters. No seed was obtained from the control cross Maarad x *G. herbaceum*. Parental plants grown as controls without crossing showed no signs of segregation.

3219 O'Kelly, J. F.
The accuracy of gossypol determinations from open pollinated vs. inbred cotton seed.
Agron. J. 1957 : **49** : 102–03.

Open-pollinated seed had a higher content of gossypol than inbred. With one exception, seed of F_1 hybrids had a gossypol content equal to, or higher than, that of the seed of their respective inbred parents. Possible reasons for the higher content in F_1 hybrids are discussed.

3220 Bhat, N. R. & Desai, N. D.
A dominant short lint mutant in *G. herbaceum*.
Curr. Sci. 1957 : **26** : 26–27.

A mutant with a mean halo length of 8–10 mm. was found in a derivative of 1027ALF x Jayavant; it also has more fuzz than either of the normal parents. The short lint proved to be a monogenic dominant character, slightly influenced by modifiers. It is independent of the gene for curled leaf and of li_d for lintlessness.

3221 Łukomski, S.
Próby aklimatyzacji bawełny w Polsce. **(Attempts to acclimatize cotton in Poland).**
Roczn. Nauk rol. Ser. A. : 1955 : **71** : 55–102.

Work carried out by the Puławy Institute of Plant Breeding and Acclimatization in Poland since 1952 is reviewed. Attempts to improve the adaptability to Polish conditions have involved both cultural and breeding methods, including intervarietal and interspecific sexual hybridization and intergeneric graft hybridization. Early maturity is one of the chief breeding objectives.

3222 Kaiwar, S. R., Pise, D. G. & Allayannawarmath, S. B.
Blackarm disease of cotton in Bombay-Karnatak.
Indian Cott. Gr. Rev. 1956 : **10** : 232–35.

Details are given of the reactions of varieties of *Gossypium herbaceum, G. arboreum, G. hirsutum, G. barbadense*, F_1 progeny of intervarietal hybrids of *G. hirsutum* and F_1 progeny of *G. barbadense* x *G. hirsutum* to *Xanthomonas malvacearum* at Dharwar. Resistance to black arm was shown by all progeny of selection 125–Co2–18, Jinja x

XAB5 and 125–Co2–18 x XAB5, all of which are strains of *G. hirsutum*.

3223 Moscovec, S. N.
(The importance of conditions of cotton seed production with regard to the disease resistance of the progeny).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1956 : **17** : 202–11. [Russian].

Turkmenian seed stocks of *Gossypium barbadense* and Uzbek seed stocks of *G. hirsutum* were distinguished by greater earliness and a different degree of susceptibility to disease compared with the same varieties raised in Azerbaijan. The material from Uzbekistan showed improved resistance to *Xanthomonas malvacearum* but decreased resistance to *Verticillium dahliae* compared with Azerbaijan material, while the seed stocks from Turkmenia showed improvements in both respects. The provenance distinctions were less marked in the second year and it is thought that they can be further reduced by environmental training and selection.

3224 Malov, N.
(An experiment on sowing cotton with graded seed).
Hlopkovodstvo (Cott.-raising) 1957 : No. 2 : 37–42. [Russian].

The heritable properties of the variety 1298 have been improved by continuous selection for large size and a high specific gravity of the seed at the Azerbaijan Agricultural Institute. The yield was increased by 10–12% and the technological properties of the fibre and resistance to wilt, gummosis and root rot were improved.

3225 Lakshiminarayanan, K.
Physiology of host-parasite relationship in the *Fusarium* wilt of cotton.
Proc. Indian Acad. Sci. 1956 : **44** : 317–24.

Results obtained from an investigation of the host pectin metabolism in varieties of cotton susceptible and resistant to *F. vasinfectum* indicate that there is a close correlation between root pectin content and susceptibility. The pectin content of healthy roots of the susceptible variety tested, *Gossypium arboreum* 'Karunganni–K2', was nearly five times that of the resistant varieties, *G. hirsutum* 'Cambodia (CO2)' and 'Madras Uganda (MU1)'. but after inoculation with *F. vasinfectum* the pectin content of the roots of the susceptible variety decreased rapidly to below that of the resistant varieties. The relationship between root pectin content and susceptibility is discussed.

3226 Wiles, A. B.
Resistance to root-knot nematode in cotton.
Phytopathology 1957 : **47** : p. 37. (Abst.).

Details are given of the response of five varieties of *Gossypium hirsutum* to *Meloidogyne incognita*, *M. incognita* var. *acrita*, *M. arenaria*, *M. javanica* and *M. hapla*. High resistance to *M. incognita* var. *acrita* was shown by *G. barbadense* var. *darwinii* but the F_1 progeny of crosses between *G. hirsutum* and *G. barbadense* var. *darwinii* were susceptible.

3227 Friederich, J. C.
The results of 3-years' co-operation in the field of international fibre flax varietal research.
Windmill, The Hague 1956 : No. 21 : 23–24; also French, p. 25; German, p. 25–26; Spanish, p. 27 and Italian, p. 27–28.

The results of trials carried out in different European countries under the auspices of the Netherlands Flax Institute with a view to testing the suitability of a wide range of Dutch varieties for cultivation under various environmental conditions are presented. Wiera and Diana gave the best all-round results and Wiera and Solido proved the most satisfactory in respect of resistance to diseases and lodging.

3228 Malyh, P. V.
(The variety of fibre flax I-16).
Lën i Konoplja (Flax & Hemp) 1957 : No. 1 : 30–32. [Russian].

The new variety is described as superior to all others tested in respect of fibre yield and quality, though somewhat more prone to lodging and lower in seed yield, and as better than the standard varieties in resistance to *Polyspora* and *Melampsora*.

3229 Rogaš, A. R.
(Breeding and seed production of fibre flax in Belgium and Holland).
Lën i Konoplja (Flax & Hemp) 1957 : No. 1 : 45–47. [Russian].

An account is given of the methods of flax breeding and its achievements in the two countries and the suggestion is made that some of the varieties produced there should be tested in the Soviet Union.

3230 Vezelvlasrassenproeven oogst 1956.
(Fibre flax varietal trials, 1956 harvest).
Zaadbelangen 1957 : **11** : 44–46.

Data on the yields of seed and fibre of eighteen

Dutch and foreign varieties tested on different types of soil in the Netherlands in 1956 are presented.

3231 Vezelvlas, 1957. **(Fibre flax, 1957).**
Landbouwvoorlichting 14 : Bijl. 3 : Ber. Rassenkeuze 1957 : No. 220 : unpaginated.

Brief descriptions are given of eleven varieties tested on different types of soil in the Netherlands in 1956. Tabulated data are also provided on the straw, seed and fibre yields of these varieties.

3232 Doucet, M. *et al.*
Contribuţii la studiul şi raionarea soiurilor de in pentru fibre. **(Contributions to the study and regionalization of fibre-flax varieties).**
Anal. Inst. Cerc. agron. Român. 1954–1955 (1956) : **23** : No. 4 : 275–95.

The results of trials of local and introduced, mainly Soviet, varieties are reported.

3233 Flor, H. H.
X-ray induced mutations for pathogenicity in the F_1 of race 22 x race 1 of the flax rust fungus.
Phytopathology 1957 : **47** : p. 11. (Abst.).

A number of X-ray induced mutants of *Melampsora lini* have been found to differ in pathogenicity from non-irradiated F_1 progeny of a cross between races 22 and 1. Of these mutants five differed in pathogenicity from races previously known.

3234 Schwinghamer, E. A. A.
Radiation-induced mutations in race 1 of the flax rust fungus.
Phytopathology 1957 : **47** : p. 31. (Abst.).

More than 4300 mutants differing in pathogenicity from their parent strain have been obtained from uredospores of *Melampsora lini* race 1 exposed to ultraviolet and X irradiation, and thermal neutrons, the majority being induced by the latter two treatments. A white-spored mutant was found to be identical in pathogenicity with the original race 1.

3235 Flor, H. H.
The vegetative origin of a new race of the flax rust fungus.
Phytopathology 1957 : **47** : p. 11. (Abst.).

A new race of *Melampsora lini* is thought to have originated from a mixed inoculum of the hybrid races 108, 123 and 218 by fusion of dicaryotic hyphae in a susceptible host.

3236 Klug, R. J.
Comparative effect of different osmotic pressures on *Colletotrichum linicolum* and on mutants induced by alpha radiation.
Phytopathology 1957 : **47** : p. 21. (Abst.).

Differences have been found between mutants of *C. linicolum* induced by α radiation in respect of their tolerance of increased osmotic pressures.

3237 Ceapoiu, N. & Itoafă, E.
Contribuţii la stabilirea tehnicii de educare a hibrizilor sexuaţi de cînepă, **(Contribution towards establishing the technique of training sexual hybrids of hemp).**
Bul. Şti. : Secţ. Biol. Şti. agric. : 1956 : **8** : 419–29.

In accordance with Mičurinist principles, the authors investigated the effect of different manurial treatments on the agronomic characteristics of a series of hemp hybrids.

3238 Crescini, F.
La fecondazione incestuosa processo mutageno in *Cannabis sativa* L. **(Inbreeding, a mutagenic process in *C. sativa* L.).**
Caryologia 1956 : **9** : 82–92.

Recessive genes for fasciation and pinnatifid leaves have been shown to be present, or to arise by mutation, in a number of hemp populations and to manifest themselves when such populations are subjected to close breeding. A certain number of plants with the leaves arranged in whorls of three, as opposed to the usual decussate arrangement, also appeared but this character was transmitted to only 5–12% of the offspring when such plants were interpollinated.

3239 Rudenko, F. E.
(Sex reversal in hemp).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 868–76. [Russian].

Detailed descriptions and illustrations are given of the female tissues that were observed in male hemp flowers at various stages of development and of male tissues occasionally observed in female flowers of certain varieties. From the observations it is concluded that the prototype

of the Urticales bore hermaphrodite flowers and that diecious species represent a derived type.

3240 Arinštein, A. I.
(Methods of speeding up the multiplication of monecious hemp).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 5 : 41–43. [Russian].

Two monecious varieties of hemp produced in the USSR are referred to, one suitable for the southern and one for the central areas, and special problems associated with their seed production are discussed. Three to four supplementary pollinations raise the seed yield by up to 15%.

3241 Chaudhuri, S. D., Eunus, A. M. & Jabbar, M. A.
Studies on colchicine induced tetraploids of jute.
Euphytica, Wageningen 1956 : **5** : 339–46.

Tetraploid plants of two varieties of *Corchorus capsularis* and three of *C. olitorius* have been produced by colchicine treatment of seedlings at the Jute Research Institute, Dacca, Pakistan. In both species tetraploid plants were shorter and more branched than diploids and had leaves larger in area, with higher length/breadth ratios and a smaller number of stomata. The flowers of tetraploid plants were larger, produced fewer fertile pollen grains and set fewer seeds than those of diploid plants, although an increase in fertility was found in C_2 as compared with C_1 plants. The fibres produced by the tetraploid plants were greater in diameter than those of diploid plants but did not show a corresponding increase in length.

3242 Nodder, C. R.
Jute breeding for high percentage of fibre in each plant.
Jute Bull. 1956 : **19** : 13–14.

The article consists mainly of a discussion of possible methods of estimating the percentage of fibre in the living plant.

3243 Matsuoka, K., Taniguchi, N. & Kawakami, M.
(Studies on the properties of kenaf and roselle).
Shikoku Nogyo Shikenjo Hokoku/Bull. Shikoku agric. Exp. Sta. 1955 : **2** : 76–90. [Japanese].

Data are provided on the fibre production, seed production and disease resistance of a series of introduced varieties of *Hibiscus cannabinus* and *H. sabdariffa.*

3244 Alcanites, H. A.
The agronomic characters of ten varieties of kenaf.
Philipp. Agric. 1954 : **38** : 355–66.

The performance of 10 nonbranching varieties grown at the Central Experiment Station, Laguna, Philippines, is described, information being given on height of the flowering node, plant height at maturity, yield of dry fibre, tensile strength, number of capsules, and duration of the periods of growth and of capsule development. Salvador Selection had the highest mean tensile strength and, after the *simplex* type, gave the highest yield of fibre.

3245 Sison, M. C.
The presence of trichomes on ten varieties of kenaf.
Philipp. Agric. 1954 : **38** : 444–64.

In a study carried out at the Central Experiment Station and College of Agriculture, Philippines, the least development of trichomes was shown by Java F_1, Formosa Selection 3–B F_1 and Maceo F_1.

3246 Valmayor, R. V., Mendoza, E. M. & Millare, V. E.
A cytological study of abacá and its relatives.
Philipp. Agric. 1956 : **40** : 269–76.

The following chromosome numbers are reported: four varieties of *Musa textilis* $n = 10$, Canton and Minay (probably *M. textilis* x *M. balbisiana*) $n = 10$, Pacol (*M. balbisiana*) $n = 11$ and Saba (*M. balbisiana*) $2n = 33$. All four varieties of *M. textilis* and the diploid variety of *M. balbisiana* were found to have normal meiosis and to produce fertile pollen and seeds but in the suspected hybrids and the triploid variety of *M. balbisiana* meiotic irregularities occurred and pollen sterility was complete.

3247 Umali, D. L., Bernardo, F. A. & Ocfemia, G. O.
Reaction of pacol-abacá F_1 hybrids to abacá mosaic and bunchy-top.
Philipp. Agric. 1956 : **39** : 47–50.

Hybrids between *Musa balbisiana* and *M. textilis* 'Maguindanao', produced at the Division of Plant Breeding, University of the Philippines, have shown complete resistance or immunity to abacá mosaic and bunchy top virus when subjected to heavy infestations of several species of virus-carrying aphids.

3248 Bernardo, F. A. & Umali, D. L.
Possible sources of resistance to abacá mosaic and bunchy-top.
Philipp. Agric. 1956 : **40** : 277–84.

Tests of various *Musa* species and hybrids have

shown that complete resistance to abacá mosaic is possessed by Pacol (*Musa balbisiana*), Agotay (*M. banksii*) and *M. ornata*, a high degree of resistance by Canton (*M. textilis* x *M. balbisiana*) and moderate resistance by Minay (*M. textilis* x *M. balbisiana*) and *Ensete glaucum*. Complete resistance to bunchy top has been found only in Pacol, although Canton possesses a high degree of resistance.

3249 Umali, D. L. & Brewbaker, J. L.
Abacá and its improvement.
Philipp. Agric. 1956 : **40** : 213–30.

The principal varieties of *Musa textilis* grown in the Philippines are described and methods of improvement outlined, emphasis being laid on interspecific hybridization as a means of increasing resistance to mosaic, bunchy-top and wilt (*Fusarium cubense*).

3250 Umali, D. L., Ick, F. R. & Orillo, F. T.
Reaction of varieties of abacá and its relatives to vascular disease.
Philipp. Agric. 1956 : **40** : 115–19.

Data are provided on the response to *Fusarium oxysporum* var. *cubense* of varieties and intervarietal crosses of *Musa textilis*, crosses between *M. textilis* and *M. balbisiana*, *M. lolodensis* and Canton. Only Canton was resistant to the fungus while *M. textilis* x *M. balbisiana* and *M. lolodensis* showed 100% mortality.

3251 Bastos de Menezes, O.
Contribução à cariologia de *Luffa*. (**Contribution to the caryology of *Luffa*.**)
Dusenia 1955 : **6** : 49–54.

Meiosis in *L. cylindrica* and *L. acutangula* was regular, with $n = 13$. The F_1 of the interspecific cross showed 60% pollen sterility and meiotic irregularities including chromosome bridges.

SUGAR AND STARCH PLANTS

3252 Federer, W. T.
A method for evaluating genetic progress in a sugar cane breeding program.
Hawaii. Plant. Rec. 1956 : **55** : 177–89.

An examination of sugar-cane yield data from four plantings at the Waipio substation of the Hawaiian Sugar Planters' Association in which systematically arranged check plots were used showed that the check plots produced no gain in efficiency; in fact the layout used was more efficient if the check-plot data were totally ignored.

3253 Federer, W. T.
Augmented (or hoonuiaku) designs.
Hawaii. Plant. Rec. 1956 : **55** : 191–208.

Augmented designs consist of a standard design with one set of treatments (standard sugar-cane varieties) repeated *b* times to which is added (interplanted) a second set of treatments (sugar-cane seedlings), each appearing once only. Examples are given of the analysis of the augmented completely randomized design, augmented randomized blocks and the augmented Latin square. Augmented designs are recommended for comparing sugar-cane seedlings with standard varieties.

3254 Li, H. W. & Chu, T. L.
New sugarcane varieties released in Taiwan, F135, F136, H32-8560 and H37-1933.
Taiwan Sug. 1956 : **3** : No. 10 : 13–16.

The first two of the varieties cited above were bred in Taiwan. F135 (= 34–1428), from POJ2725 x PSA32, has a higher sugar content than N:Co310. F136 (= 36–1119) is a thick-barreled cane with a tendency towards prostrate growth but a high sugar yield.

3255 **Report of the Philippine delegation to the 9th World Congress of the International Society of Sugarcane Technologists in India.**
Philipp. Sug. Inst. Quart. 1956 : **2** : 22–34.

A brief account of the work of the sugar-cane breeding institute at Coimbatore in improving Indian varieties is included in this report.

3256 Espino, H. R.
Report on sugarcane hybridization in Puerto Rico, Florida and Hawaii.
Philipp. Sug. Inst. Quart. 1956 : **2** : 35–51.

In the main part of this article the breeding techniques and methods of selection used in Puerto Rico, Florida and Hawaii are briefly described, together with details of the parentage of some leading varieties. This is followed by two appendices giving (1) a list of the varieties in the collection at the sugar plant field station, Canal Point, Florida in 1955 and (2) the symbols used by breeding stations throughout the world and some of their more important varieties.

3257 **Sugar cane research in Mauritius.**
Int. Sug. J. 1957 : **59** : 3–4.

Principal aims of the breeding programme are firstly to obtain varieties adapted to the drier localities of the island and secondly to develop early-maturing varieties. The new canes M129/43, M147/44 and M31/45 mature early and give high yields of cane and sucrose. The

last two also have a ratooning capacity markedly superior to that of M134/32. Failure in anther dehiscence is one of the major difficulties experienced in breeding; canes grown at high altitudes suffer less in this respect than those grown at low altitudes. Ebène 1/37 [Ebony 1/37] appears to be moderately resistant to ratoon stunting disease but is highly susceptible to chlorotic streak, to which M134/32 and B3337 are fairly resistant.

3258 **Twenty-second Annual Report of the British West Indies Central Sugar Cane Breeding Station, Barbados, for the year ending September 30th, 1955** : Pp. 50.

The results of seedling trials are reported in detail. Further crosses involving complex interspecific parentages were effected. Pure-line breeding continued, some degree of homozygosity for factors determining fertility being attained in some lines. The greatest amount of fertility was found among lines developed from B4098, B41211 and B37161. Second-generation selfs included a satisfactory proportion having good juice quality. The proposed inclusion of crosses between inbreds in the main breeding programme constitutes a major change in policy. Seedlings from such crosses will be subjected to the normal procedure of selection. In addition to the chromosome numbers previously given (cf. Abst. 733), $2n = 120$ is reported for *Saccharum spontaneum* 'Tukuyu 2' from Tanganyika and H32–8560. Determinations of chromosome numbers in selfs and close inbreds developed from hybrid material indicated that several generations of inbreeding may be required before meiotic stability is reached.

3259 M.-L., H.
Sugar cane breeding in the West Indies.
Int. Sug. J. 1957 : **59** : p. 7.

Two new seedlings, B4744 and B49119, have shown promise in recent trials of 3-year seedlings. B4744 does well on all types of soil except sandy soils. B49119 is highly resistant to drought and flowers well at higher altitudes. The most promising canes at the present time are B45151, B4744 and B47419, which are replacing varieties such as B34104 and B37161.

3260 Toohey, C. L.
A new variety—Q.61.
Cane Gr. quart. Bull. 1957 : **20** : 76–77.

The sugar-cane variety Q61 (POJ2878 x Co.290), released in Queensland, possesses desirable growth characters and is superior to CP29/116, Q47 and Q49 in sugar content.

3261 **1955 Report of the Experiment Station Committee of the Hawaiian Sugar Planters' Association** : Pp. 66.

Cytological investigations and crossing by the melting-pot technique and other methods continued; no details are given. The status of varieties, as indicated by trials at experimental centres and on estates, is surveyed. Slash cutting of experimental plots, instead of cut-and-pull harvesting, results in a substantial reduction in the labour required and also in less border effect. A "pol ratio" procedure of analysing the quality of cane samples from variety and other experiments is described; it entails disintegrator analysis of samples chopped by a silage cutter.

3262 **1956 Report of the Experiment Station Committee of the Hawaiian Sugar Planters' Association** : Pp. 74.

The canes found to be the most valuable as parents, as indicated by the percentage of their seedlings qualifying for the later stages of testing, are listed. The programme of biparental crossing is concentrated upon combinations of these élite parents.

Cytogenetical investigations continued.

Various changes being made in procedures of tests of seedlings at the regional stations and on the estates are described. To a large extent these have been necessitated by the switch over from cut-and-pull harvesting to slash cutting. One of the modifications to be adopted in making preliminary tests is the "augmented block design", by means of which replicated testing of a standard variety and its competitors and nonreplicated testing of new seedlings are combined in a single trial (cf. Abst. 3253).

Information is given on varieties showing promise as substitutes for standard varieties, should these begin to fail as the result of attack by diseases and pests in any region.

3263 Cheng, C.-F.
Dosage effect as expressed in the inheritance of starch grains in the internodal parenchyma cells of stem in sugarcane hybrids.
Taiwan Sug. 1956 : **3** : No. 11 : 18–20.

Further to the studies referred to in Abst. 2024, the author examined the internodal parenchyma of sugar cane x *Miscanthus japonicus* crosses for the presence of starch grains. These occurred in hybrids of genomic constitution OMM only.

3264 Li, H. W.
March of sugarcane varieties in Taiwan.
Taiwan Sug. 1954 : **1** : No. 2 : 14–19.
An account is given of the sequence of varieties cultivated in Taiwan during the past 50 years.

3265 Wang, C.-C.
(Ratooning capacity and ratoon stunting of sugar cane).
Taiwan Tahsueh Nunghsuehyuan Yenchiu Paohao/Mem. Coll. Agric. Taiwan Univ. 1956 : **4** : No. 2 : 15–35. [Chinese].
Data are provided on behaviour as a ratoon crop and the incidence of ratoon stunting in some of the more important varieties grown in Taiwan.

3266 Moriya, A.
Comparative morphology of the wild sugarcanes in Japan islands.
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 122–25.
A comparative morphological study of *S. spontaneum* from the Japanese mainland, the Ryukyu islands and Taiwan is presented, particular attention being paid to the ligule. The samples from the Ryukyu islands were markedly dissimilar to the other specimens.

3267 **Another cane-collecting expedition to New Guinea.**
Aust. Sug. J. 1957 : **48** : 757, 759, 776.
Besides briefly reporting that a sugar-cane collecting expedition to New Guinea is to be undertaken in 1957 by American scientists, the article gives a short account of earlier collecting expeditions to this area, together with descriptive notes on the *Saccharum* spp. found there.

3268 Tamai, T.
A method for determining drought resistance in crops.
Sci. Rep. Matsuyama Agric. Coll. 1954 : No. 13 : 21–26.
The technique described depends on recording the rate of recovery of growth of wilted plants after water is added to the soil. A specially constructed auxanometer is used and *Mimosa pudica* is interplanted with the plants under investigation as a soil-moisture indicator. The technique has been used for determining varietal drought resistance in sugar cane.

3269 Rafay, S. A. & Singh, V. B.
A new strain of *Glomerella tucumanensis*.
Curr. Sci. 1957 : **26** : 19–20.
A strain (I) showing greater virulence than strain D on all sugar-cane varieties tested, with the exception of Co.453, has arisen in Uttar Pradesh.

3270 Coleman, O. H. *ET AL.*
New variety of sorgo developed, named Wiley.
Miss. Fm. Res. 1956 : **19** : No. 8 : p. 1, 7.
A detailed description of the characteristics and performance of this variety which has already been referred to in Abst. **745**.

3271 Orlovskiĭ, N. I., Okanenko, A. S. & Zosimovič, V. P.
(The 60th anniversary of the birth of the plant breeder T. F. Grinjko).
Sahar. Svekla (Sug. Beet) 1957 : No. 1 : 46–47. [Russian].
Mention is made of the new sugar-beet varieties from Verhnjačka, V024, V031 and V046, which are notable for high sugar and root yield.

3272 Dickenson, D. D. & Peterson, D. F.
Results of use of the red-marker beet as a top cross parent.
J. Amer. Soc. Sug. Beet Tech. 1956 : **9** : 217–20.
In investigations carried out by the Holly Sugar Corporation, USA, half-sugar, half-red garden beet was used as the top-cross parent in combinations with nine pollen-producing inbred sugar-beet varieties, the top-cross plants being identified in the seedling stage by means of the dominant red colour of the garden-beet parent. Yield data for the three test centres indicated that certain varieties produced top crosses which outyielded their sugar-beet parents. The correlation coefficient between the yield of the sugar-beet varieties and that of the top crosses was not significant at two centres; in the third locality the coefficient ($r = 0{\cdot}90$) was significant at the 1% level. In general, the yield of a variety did not therefore necessarily provide an indication of general combining ability. On the whole, the sucrose content of the crosses was of similar magnitude to the mean of the parents.

3273 Oldemeyer, R. K.
Red beets—key to hybrid sugar beets.
Thr. Leaves 1956 : **44** : No. 5 : 33–37.
An account is given of the use of top crosses between red beets and sugar-beet inbreds as a means of predicting the combining ability of the latter in combination with other sugar-beet inbreds. The method is being applied at the experimental station of the Great Western Sugar Co., Longmont, Colo.

3274 Sedlmayr, K.
The use of heterosis in breeding *Beta vulgaris*.
Acta agron. Budapest 1956 : **5** : 285–300.
In the first part of this lecture the author discusses the commercial exploitation of hybrid vigour and outlines methods of increasing the percentage of hybrids produced by plants with hermaphrodite flowers which cannot conveniently be emasculated. In the second part methods used in Hungary for producing triploid heterotic beets are described.

3275 Fidler, I. [Fiedler, I.]
(Vegetative hybridization between the sugar beet and mangel).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. : 1956 : No. 3 : 87–95. [Russian].
An extended account of the report summarized in Abst. 749 is given.

3276 Kloen, D.
De opbouw van tetraploide families van suiker- en voederbietenrassen. **(The production of tetraploid families from sugar beet and mangel varieties).**
Zaadbelangen 1956 : **10** : 339–42.
This popular article on the development of tetraploid forms of sugar beet and mangel by means of colchicine treatment deals with the agronomic merits of such forms, ways in which they may be distinguished morphologically from diploids and methods of ensuring that they are not pollinated by diploids. The yields and contents of dry matter and sugar of diploid and tetraploid strains are compared.

3277 Kloen, D. & Speckmann, G. J.
The creation of tetraploid beets. IV. Morphological and physiological characteristics of C_2 beets.
Euphytica, Wageningen 1956 : **5** : 308–22.
Continuing the study of tetraploid sugar and fodder beets (cf. *PBA*, XXIV, Absts. 2293–4 and XXV, Abst. 434) details are given of investigations of various morphological and physiological characters including germinating capacity, bolting resistance and yield, measured as fresh and dry weight. The tetraploid plants produced more leaves than their diploid parents and showed better bolting resistance. Considerable variation was found within tetraploid families in respect of germinating capacity but it is thought that this variation is due to the presence of aneuploids, which can be eliminated by selection. No great differences were found between diploids and tetraploids in respect of dry matter, protein and sugar content of the roots but in these characters also the tetraploid material showed wide variability and it is hoped to obtain considerable improvement by selection.

3278 Sedlmayr, K.
Poliploid cukorrépahibridek. **(Polyploid sugar-beet hybrids).**
Agrártudomány 1955 : **7** : 508–13.
Tabulated data are presented on root yield, leaf yield, sugar content and sugar yields per ha. of Beta 1, a new polyploid sugar beet variety, as compared with Beta K–91 (Beta C242/53 x Beta E III) and with other well-known diploid varieties. In variety tests conducted in Hungary, Austria, Poland and China, Beta 1 proved highly resistant to *Cercospora*. The root and leaf yields reach the level of the best E varieties.
Beta 1 has desirably low noxious nitrogen and ash contents. Little bolting occurs and seed yields in the second year are equal to those of current diploid varieties.

3279 Burtch, L.
Improved sugar beet strains achieved by Spreckels research.
Spreckels Sug. Beet Bull. 1957 : **21** : No. 1 : 4–5, 8.
Since 1952 the varieties S–1 to S–5 have been released by the Spreckels Sugar Company for specific areas in California. S–1, S–3 and S–4 are sufficiently resistant to bolting to allow overwintering without the production of an excessive number of seed stalks before harvesting in spring. S–2 and S–3 possess resistance to curly top, an important disease in the San Joaquín Valley. S–1 and S–2 are sufficiently resistant to mildew for cultivation in the coastal area. S–5 shows some resistance to *Cercospora* leaf spot. The increase in sugar production per acre obtained from these varieties is due to increased tonnage, the sugar percentage being slightly reduced in comparison with the control US56. The results of trials have however indicated that hybrid varieties may combine high tonnage and high sugar content.

3280 Oldemeyer, R. K.
Our progress toward single-germ seed.
Thr. Leaves 1957 : **45** : No. 1 : 16–18.
The conversion of sugar-beet varieties developed by the Great Western Sugar Company, USA, to the monogerm condition has been completed in some cases and almost completed in others. One monogerm variety is to be released in 1958, chiefly with the purpose of gaining experience

in the processing and precision planting of this type of seed.

3281 Hosokawa, S. & Saito, K.
(On the heritability of resistance to *Cercospora* in sugar beet. I).
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1956 : No. 70 : 50–55. [Japanese].

The heritability and number of effective genes affecting resistance to *C. beticola*, sugar content, root weight, plant height and leaf number were estimated from a genetical analysis of the F_0, F_1, F_2 and back crosses of G91 (*Cercospora* resistant) x G14 (susceptible). Heritability values were low for all characters. The estimated numbers of effective factors (not determined for root weight) were 2·82 for *Cercospora* resistance, 2·15 for sugar content, 2·45–35·53 for plant height and 0·48–3·56 for leaf number. The variation in the last two cases was dependent on the stage in the life cycle that was measured.

3282 Bush, H. L. & Brewbaker, H. E.
Genetic variability of sugar beets in relation to spider mite injury.
J. Amer. Soc. Sug. Beet Tech. 1956 : **9** : 275–76.

Considerable differences in susceptibility to spider mite were observed among varieties, inbreds and hybrids, when a test field at the Longmont Experiment Station of the Great Western Sugar Co. in Colorado became infested by chance. With the exception of one variety, freedom from spider mite was associated with known resistance to leaf spot.

3283 Kloen, D.
Polyploïde suiker- en voederbieten.
(Polyploid sugar beets and mangels).
Landbouwk. Tijdschr., Wageningen 1957 : **69** : 44–52.

The germinating seeds of four varieties of sugar beet and three varieties of mangel were treated with a 0·1–0·2% colchicine solution at a temperature of 28° C. and the young plants were later examined cytologically to establish which of them were tetraploids. The tetraploid plants were then isolated and seed from them was later harvested and sown. At the end of the first year, the C_1 tetraploids showed a greater range of variability as regards size of the leaves and growth rate than the original diploid material; similarly, the mature roots, at the end of the second year, showed a greater range of variability as regards size and dry matter, protein and sugar contents. Some of the tetraploids were markedly superior to the 2*n* varieties from which they had been obtained. The more promising of the 4*n* sugar beet and mangel families have been subjected to a rigorous selection and are now being crossed *inter se* with a view to obtaining new varieties of improved agronomic merit, possibly possessing hybrid vigour, and are also to be crossed with diploid varieties in order to obtain triploid forms.

3284 Lewicki, S. & Ruszkowski, M.
Cecha barwności kiełków buraków cukrowych w ujęciu biologiczno-rolniczym. **(The character of pigmentation in sugar-beet seedlings in the light of agricultural biology).**
Ann. Univ. M. Curie-Skłodowska 1955 : **10** : 49–75.

In studies of 25 beet varieties, individual varieties tended to produce characteristic ratios of pigmented : unpigmented seedlings, the extreme ratios being 32 : 1 and 1 : 1. Further results suggested that pink seedlings generally develop into more vigorous plants with larger roots but lower sugar content than unpigmented seedlings.

3285 Pfitzer, P.
Chromosomenzahlen von Araceen.
(Chromosome numbers of the Araceae).
Chromosoma 1957 : **8** : 436–46.

The results of studies on the chromosome numbers of 63 species of Araceae are tabulated. In *Colocasia antiquorum* var. *aquatilis*, $2n = 28$.

3286 Shimomura, T., Yamaguchi, A., Uritani, I. & Hirai, T.
(Resistance of lotus to *Fusarium bulbigenum* var. *nelumbicolum*).
Nihon Shokubutsubyorigaku Kai Ho/ Ann. phytopath. Soc. Japan 1955 : **20** : 47–53. [Japanese].

A comparative study of the resistant variety Shina and the susceptible variety Usu showed that resistance was not associated with content of phenolic compounds but was apparently determined by some particular metabolic response.

STIMULANTS

Premier Congrès Scientifique International du Tabac. **(First International Scientific Congress on Tobacco).**
1955 : Pp. 803.

3287 *Bolsunov, I. Études génétiques et travaux d'amélioration des variétés de tabac. (Genetical studies and breeding work on tobacco varieties). (pp. 11–14).*

Work at the Fürstenfeld Tobacco Breeding

Station, Styria, Austria, includes the introduction and acclimatization of foreign varieties, the development of new forms of Burley tobacco suitable for Austrian conditions, interspecific hybridization, breeding for resistance to seedbed diseases (cf. *PBA*, XXVI, Abst. 3592) and the development of varieties with high or low nicotine contents (cf. *PBA*, XXV, Abst. 1294), without axillary buds (cf. *PBA*, XXII, Abst. 2121) or maturing early (cf. *PBA*, XXIII, Abst. 2874). Gigas and tetraploid strains have also been developed (cf. *PBA*, XXIII, Abst. 2869) and progress has been achieved in maintaining hybrid vigour beyond the F_1–F_2 generations (cf. Abst. 1460).

3288 *Larose, E., Legros, R. & Cantillon, P. Sommaire des principales recherches effectuées sur tabac à la Station de Recherches, de l'État pour l'Amélioration des Plantes de Grande Culture à Gembloux.* (*Summary of the principal studies carried out on tobacco at the State Experimental Station for the Improvement of Crop Plants at Gembloux*). (*pp. 21–26*).

This review of research on tobacco growing and breeding at the above research station, which is situated in Belgium, includes brief information on breeding aims, including the development of interspecific hybrids, and tabulated data on the nicotine and nornicotine contents of the more important varieties grown in Belgium.

3289 *Vickery, L. S. Research on flue-cured tobacco in Canada.* (*pp. 27–30*).

Tabulated data are presented on the yield, quality, period to maturity and disease resistance of some of the more important varieties grown at the Dominion Experimental Substation, Delhi, Ontario, Canada, and breeding work there is outlined briefly, with special reference to the development of varieties resistant to *Thielaviopsis basicola*.

3290 *Alcaraz Mira, E. Rapport sur les activités de recherches et d'expérimentation de l'Institut de Biologie du Tabac, Séville (Espagne).* (*Report on the activities of the Institute of Tobacco Biology, Seville, Spain, in research and experimentation*). (*pp. 31–38*).

Breeding work at the above station has as its primary objectives the development of varieties resistant to common mosaic, the production of tobaccos with improved combustibility and the induction, by colchicine treatment, of tetraploid forms of varieties of *Nicotiana tabacum*.

3291 *Compte rendu général des activités de recherche du Service d'Exploitation Industrielle des Tabacs (Régie Française des Tabacs).* [*General account of the research activities of the Organization for the industrial utilization of tobacco (French Tobacco Monopoly)*]. (*pp. 39–53*).

Among the subjects touched upon in the section of this report that is concerned with the breeding and genetics of tobacco at the Bergerac Tobacco Research Institute, France, are the induction of mutations by means of X irradiation, mustard gas and heat treatment, the cytogenetics of mutants obtained in this way (cf. *PBA*, XXIII, Abst. 88), interspecific hybridization (*cf. PBA*, XXIII, Abst. 546) and the study of tumours found to occur in some of these hybrids (cf. *PBA*, XXIII, Abst. 546). Genes for resistance to common mosaic have been transferred from *Nicotiana glutinosa* to cultivated tobaccos.

3292 *Mangin, H. Travaux de sélection et d'hybridization à la Station Expérimentale Agricole d'Isserville (Algérie).* (*Selection and hybridization work at the Isserville Agricultural Experimental Station, Algeria*). (*pp. 56–60*).

Unfavourable soil and climatic conditions in the tobacco-growing Kabylie district of Algeria prevent the successful cultivation of high-quality foreign tobaccos and a programme of selection and hybridization is therefore being carried out to improve the leaf quality of local varieties such as Chebli, Spada, Djendel and Colon 1–1 and 1–2. A number of promising strains have also been obtained by crossing local varieties with Virginian and oriental tobaccos introduced from abroad.

3293 *Berthaut, J. La Station Expérimentale Agricole de Bône Bou-Hamra et son action dans l'amélioration de la région de Bône.* (*The Bône Bou-Hamra Agricultural Experimental Station and its action in improving the production of tobacco in the Bône district*). (*pp. 61–69*).

The work of the above experimental station in introducing and testing foreign introductions of tobacco in the Bône district of Algeria, in selecting improved strains of local varieties and in crossing local varieties with high-quality foreign introductions is outlined briefly.

3294 *Egri, L. Institut Expérimental du Tabac de Budapest.* (*Budapest Tobacco Experimental Institute*). (*pp. 70–74*).

Among the objectives of the Budapest Tobacco Experimental Institute are the development of early-maturing varieties with a low nornicotine

content and improved combustibility. Promising results have been obtained by vegetative hybridization.

3295 *Scarascia, G. T. Rapport de l'Institut Scientifique Expérimentale de Tabacs de Rome.* (*Report of the Tobacco Scientific Experimental Institute, Rome*). (*pp. 75–86*).

Among the subjects being studied at the above research institute are the induction of mutations by chemical treatment, the action of alkaloids on root-tip mitosis (cf. *PBA*, XXV, Absts. 40 and 3291), chromosome aberrations induced by X irradiation, thermal neutrons and γ rays (cf. *PBA*, XXVI, Abst. 1568), the cytological effects of aqueous extracts of seeds of *N. rustica* (cf. *PBA*, XXVI, Abst. 566) and the development of autotetraploid forms of *N. tabacum* and *N. rustica* and of amphidiploid hybrids between *N. tabacum* and *N. glutinosa* and *N. tabacum* and *N. megalosiphon*.

3296 *Pyriki, C. Compte rendu des travaux de l'Institut de Recherches du Tabac à Dresde.* (*Account of the work of the Dresden Tobacco Research Institute*). (*pp. 87–99*).

A brief summary is given of breeding work being carried out on new varieties for the production of cigarette, cigar and chewing tobacco at the Dresden Tobacco Research Institute, Eastern Germany. None of the varieties studied proved resistant to *Thielaviopsis basicola* but some were less susceptible than others. Varietal differences in reaction to mosaic virus were noted.

3297 *Schmid, K. Rapport sur les travaux scientifiques effectués à l'Institut des Tabacs de Forchheim* (*République Fédérale Allemande*). (*Report on scientific work carried out at the Forchheim Tobacco Institute, German Federal Republic*). (*pp. 100–11*).

Abstracts are given of recent publications by the above institute on the breeding, genetics, pathology and biochemistry of tobacco.

3298 *Akkoyunlu, Z. & İpekoğlu, F. Exposé général des travaux exécutés par l'Institut de Tabac de Turquie.* (*General account of work carried out by the Turkish Tobacco Institute*). (*pp. 114–19*).

Breeding work on tobacco in Turkey is reviewed briefly with reference to the techniques employed and the wide range of genetical material available in this country.

3299 *Beaka, C. Rapport de l'Institut des Tabacs de Prilep.* (*Report of the Prilep Tobacco Institute*). (*pp. 120–26*).

An historical account of the work of the Prilep Tobacco Institute, Macedonia, since its foundation in 1945 is presented. Improved strains of the variety Yaka [Foot-hills] have been obtained by selection. American, Turkish and other foreign varieties have been introduced, tested and crossed with local material.

3300 *Goodspeed, T. H. Genetics of* Nicotiana. (*pp. 131–66*).

The morphological characteristics of *Nicotiana* spp. are discussed and the literature on the genetics and cytology of this genus is reviewed with special reference to the geographical distribution of the different species and attempts at interspecific hybridization.

3301 *Hitier, H. Les recherches récentes dans le domaine de la génétique des* Nicotiana. (*Recent research in the field of* Nicotiana *genetics*). (*pp. 175–84*).

The results of world research since 1951 on breeding and genetics in the genus *Nicotiana* are summarized, with particular reference to interspecific hybridization and the artificial induction of polyploidy and mutations.

3302 *Cota Galán, R. Étude de la formation de la nicotine chez certaines variétés de* Nicotiana rustica *cultivées en serre.* (*Study of nicotine formation in certain varieties of* N. rustica *grown in the greenhouse*). (*pp. 187–210*).

Information is included on differences in the nicotine content of the leaves of twelve varieties of *N. rustica* compared at the Institute of Tobacco Biology, Seville, Spain, and on differences in the reactions of these varieties, as regards nicotine content, time of topping and different levels of fertilizer. The varieties Bolsunov 5, Samenran and Erbasanta give good results under Spanish conditions and crosses have been carried out between them.

3303 *Izard, C. & Hitier, H. Cytogénétique d'un hybride complexe présentant le syndrome de stérilité mâle.* (*Cytogenetics of a complex hybrid showing the syndrome of male sterility*). (*pp. 211–13*).

The substance of this article has been summarized from another source in *PBA*, XXVI, Abst. 2678.

3304 *Scarascia, G. T. Action des neutrons thermiques sur la germination et le développement du tabac.* (*Action of thermal neutrons on the germination and development of tobacco*). (*pp. 214–23*).

Rings, double bridges and chromosome fragmentation were observed in the root-tip cells of seedling plants raised from seeds that had been

irradiated with thermal neutrons. The frequency of chromosome abnormalities showed a linear relationship with dose; doses of above $10{\cdot}8 \times 10^{13}$ neutrons/cm.^{2} proved lethal.

3305 *Fardy, A. Rapport général de sélection.* (*General report on breeding*). (*pp. 235–41*).
Recent work on tobacco breeding is reviewed with special reference to intervarietal and interspecific hybridization. It is suggested that a world collection of tobacco varieties be instituted to facilitate future breeding work on an international scale.

3306 *Bolsunov, I. La sélection des tabacs dans les pays de l'Europe.* (*Tobacco breeding in European countries*). (*pp. 249–72*).
Cf. *PBA*, XXVI, Abst. 1563.

3307 *Oka, H. On the native varieties of tobacco in Japan.* (*pp. 316–21*).
Tobacco was first introduced into Japan at the beginning of the seventeenth century, since which time breeding work has been carried out with the principal objective of developing light, fine-leaved varieties resistant to diseases, in particular to bacterial wilt and black root rot. Native Japanese varieties at present account for some 35% of the total area devoted to tobacco cultivation, and these varieties are described in some detail.

3308 *Schwartz, D. Recherche de tests permettant d'évaluer l'influence du milieu sur la variabilité de diverses caractéristiques d'une plante. Applications à la sélection.* (*Study of tests permitting the evaluation of the effect of environment on the variability of different characters in a plant. Applications to breeding*). (*pp. 322–24*).
Studies of the distribution of a given character among plants in the same field are of considerable assistance in ascertaining whether variations in this character are due to genetical variability or microenvironmental influences. The application of this technique to breeding is discussed.

3309 *Schwartz, D., Fardy, A. & Cuzin, J. Résultats obtenus en sélection par la méthode des caractères liés.* (*Results obtained in breeding by the method of linked characters*). (*pp. 325–27*).
The authors apply Larroque's method, which is based on the identification of hereditary complexes in a given population and on the subsequent selection of complexes including the character desired (cf. *PBA*, XXIII, Abst. 1123), to tobacco breeding. The five linked characters employed in this case are nicotine content, length of the style, number of leaves, length of the corolla and flower colour.

3310 *Wolf, F. A. & Wolf, F. T. The chlorophyll content of certain flue-cured and Turkish tobacco varieties.* (*pp. 518–22*).
The contents of chlorophylls a and b of the green leaves of twelve tobacco varieties, comprising flue-cured, Turkish and Burley types, were determined by the spectrophotometric method. In general, flue-cured varieties tended to have higher chlorophyll contents than Turkish tobaccos and the latter had higher chlorophyll contents than Burley types. Turkish 18, which had most chlorophyll, contained three times as much as White Burley, which had least. No significant differences were found between varieties in the proportion of chlorophylls a and b in the green leaves, but in yellow, mature leaves and during the preliminary stages of drying, the proportion of chlorophyll a, which is less stable than chlorophyll b, decreased more rapidly in flue-cured varieties than in the others.

3311 *Alcaraz Mira, A. La résistance à la mosaïque ordinaire* (Marmor tabacci *var.* deformans, *Holmes*) *des variétés de tabac.* [*The resistance of tobacco varieties to common mosaic* (M. tabaci *var.* deformans, *Holmes*)]. (*pp. 587–601*).
When grown in the greenhouse, a number of strains bred at the Institute of Tobacco Biology, Seville, Spain, proved resistant to tobacco virus 1; some of these strains, however, later proved susceptible when grown in the field. Precox, Hybrid 20 and Java Isère x Cabot proved fairly resistant. Several hybrids derived from crosses between *Nicotiana tabacum* and *N. glutinosa* possessed a high degree of resistance, although their reaction varied somewhat in different years and according to conditions of infection.

3312 Bolsunov, I.
Zum Problem der Wahl einer für den österreichischen Tabakanbau geeigneten Burley-Sorte. (**On the problem of choosing a Burley variety suitable for tobacco cultivation in Austria**).
Tabakpfl. Öst. 1956 : 7 : No. 4 : 1–6.
The author points out that the cultivation of Burley tobacco on a large scale in Europe has proved impracticable because of the susceptibility of these varieties to low temperatures, virus diseases and soil fungi, in particular *Thielaviopsis basicola*. A collection of Burley varieties from different parts of the world has

been instituted at the Tobacco Research Station, Fürstenfeld, Austria, and a breeding programme to develop varieties adapted to Austrian conditions is being carried out. Promising varieties so far developed include Phönix, which is moderately resistant to soil fungi, Perfekt and Big Tabak.

3313 Deĭmontovič, B. I.
(A *Nicotiana rustica* variety developing few suckers).
Agrobiologija (Agrobiology) 1956 : No. 4 : 123–25. [Russian].

Lohis (Omega x Hmelovka 125) was bred at the Ukrainian substations of the Tobacco Institute. It combines the high yield of the Ukrainian varieties with the fine leaf quality of Čuvaš tobaccos and develops only few suckers. In recent trials in the Lipeck and Poltava provinces it outyielded all other varieties.

3314 Surkov, N. M.
(The results of tobacco varietal trials in Moldavia).
Tabak (Tobacco) 1956 : No. 4 : 51–52. [Russian].

Mention is made of the aromatic varieties Dubec 44 and Samsun 940, which are characterized by high yield and good carbohydrate: protein ratios.

3315 Takenaka, Y.
(Cytogenetical studies in *Nicotiana*. IX. Meiosis in F_1 hybrids between tobacco and 2 other species).
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 104–08. [Japanese].

A full account is given of meiosis in the F_1 hybrids *N. tabacum* x *N. alata* and *N. tabacum* x *N. tomentosiformis*. The preliminary account formed part of the report summarized in Abst. 1252.

3316 Hu, C.-H.
(Cytogenetical studies in *Nicotiana*. XII. Meiosis in F_1 hybrids between *N. Langsdorffii* on the one hand and three other species on the other).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 117–21. [Japanese].

This paper forms part of the series on tobacco cytogenetics initiated by Takenaka and summarized *passim* in *Plant Breeding Abstracts*. The three hybrids investigated involved *N. alata*, *N. tabacum* and *N. rustica*, respectively. The corresponding modal bivalent frequencies were 9_{II}, 11_{II} and 4_{II}.

3317 Takenaka, Y.
(Cytogenetical studies in *Nicotiana*. XIV. Meiosis in 5 interspecific combinations).
Idengaku Zasshi/Jap. J. Genet. 1956 : **31** : 155–61.]Japanese].

Meiosis is described in the F_1 of the following combinations: *N. sylvestris* x *N. otophora*, *N. sylvestris* x *N. tomentosa*, *N. tabacum* x *N. solanifolia*, *N. debneyi* x *N. tabacum* and *N. rustica* x *N. paniculata*. The respective modal bivalent numbers for the first four combinations are $2–3_{II}$, 3_{II}, 1_{II} and 2_{II}. In *N. rustica* x *N. paniculata*, 2–12 bivalents and 0–10 trivalents were observed.

3318 Takenaka, Y.
(Cytogenetical studies in *Nicotiana*. V. Meiosis in the F_1 of 3 interspecific hybrid combinations involving *N. suaveolens*).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1953 : **66** : 269–76. [Japanese].

Meiosis in F_1 plants of hybrids between *N. suaveolens*, on the one hand, and *N. gossei*, *N. longiflora* and *N. plumbaginifolia*, on the other, is described. The preliminary report of these investigations was summarized in Abst. 230.

3319 Kordjum, E. L.
(Deviations in embryological processes of *Nicotiana rustica* when employing distant hybridization).
Bot. Ž. (Bot. J.), Kiïv 1955 : **12** : No. 4 : 26–34. [Ukrainian].

N. rustica varieties were fertilized by the pollen of (1) *N. viscosa* + *N. tabacum*, (2) *N. viscosa* + self pollen and (3) *N. viscosa*. Hmelevka x *N. viscosa* + *N. tabacum* gave a diploid progeny indistinguishable from the seed parent and the varieties Želtaja 109 [Yellow 109] and Pomorskaja 179 [Littoral 179], pollinated by self pollen + *N. viscosa*, gave progenies resembling the respective seed parents except that the plants were characterized by retarded development. Embryological observations on the *N. rustica* varieties pollinated by *N. viscosa* showed that the pollen tubes reached the ovaries after 36 hr. and the embryo sacs after 48 hr. Two sperm cells were visible in each pollen tube, but the contents of the pollen tubes were not discharged into the embryo sacs. Concurrently endosperm began to form and in the case of Hmelevka and Pomorskaja 179, the inception of parthenogenetic development of the egg cell was observed. Hmelevka was capable of developing viable parthenocarpic seed giving

rise to plants with the diploid chromosome number.

3320 **Flue-cured tobacco varieties in North Carolina.**
Ext. Circ. N.C. agric. Exp. Sta. 1956 : No. 302 (revised) : Pp. 22.
This circular includes detailed descriptions of 23 varieties commonly grown in North Carolina.

3321 Bhat, N. R. & Krishnamurty, K. V.
Fasciation of stamens in interspecific *Nicotiana* hybrids.
Sci. & Cult. 1956 : **21** : 746–48.
In some of the flowers of four out of the six F_1 plants of *N. megalosiphon* x *N. glauca* studied at the Central Tobacco Research Institute, Rajahmundry, Madras, the stamens were fasciated and pistilloid. Since the first-mentioned parent was affected by fasciation of the gynecium the modification of the stamens in the hybrid may have been caused by a sex-linked gene.

3322 **Preliminary list of Nicotiana.**
Centre de Coopération pour les Recherches Scientifiques relatives au Tabac, Paris 1957 : Pp. 184; also in French.
The list provides an inventory, in both English and French, of the collections of *Nicotiana* spp. and interspecific hybrids maintained at institutes belonging to the above organization and available for exchange among its members. The list includes notes on origins and characteristics.

3323 **Kentucky 61 New Burley.**
What's New Crops Soils 1957 : **9** : No. 5 : p. 24.
Tests in Kentucky have indicated that this variety is satisfactory and it is to be released during 1957. Giving good yields, of good quality, it is outstanding for its resistance to mosaic, *Pseudomonas tabaci* and *Thielaviopsis basicola.*

3324 Lautz, W.
Resistance to black shank of 51 species of *Nicotiana* and of 13 interspecific hybrids.
Plant Dis. Reptr. 1957 : **41** : 95–98.
High resistance to *Phytophthora parasitica* var. *nicotianae* was shown by *N. longiflora* and *N. plumbaginifolia* and moderate resistance by *N. undulata, N. nudicaulis, N. paniculata, N. repanda, N. rustica* var. *brasilia, N. rustica* var. *pumila* and *N. undulata* in tests carried out over a period of five years by the Field Crops Research Branch of the USDA. Higher resistance was shown by F_1 progeny of *N. debneyi* x *N. glauca* than by either of the parent species and *N. tabacum* x *N. benavidesii* showed greater survival than *N. benavidesii.* Progeny of *N. tabacum* x *N. longiflora* showed considerably greater survival than *N. tabacum* x *N. plumbaginifolia* although *N. longiflora* is only slightly more resistant than *N. plumbaginifolia.* The bearing of this study on breeding for black-shank resistance is briefly discussed.

3325 Powell, N. T. & Nusbaum, C. J.
Pathogen-suscept relations of *Phytophthora parasitica* var. *nicotianae* in roots of certain tobacco varieties and *Nicotiana* species.
Phytopathology 1957 : **47** : 27–28. (Abst.).
Differences have been found both in the extent of cortical penetration shown by different strains of *Ph. parasitica* var. *nicotianae* on the same tobacco variety and also between the responses to invasion shown by the different susceptible varieties tested, hypersensitive reactions being shown in some cases.

3326 Chapman, R. A.
Reaction of species of *Nicotiana* to species of root-knot nematodes.
Phytopathology 1957 : **47** : p. 5. (Abst.).
Details are given of the response of over 50 species of *Nicotiana* to *Meloidogyne hapla, M. incognita, M. arenaria* and *M. javanica.*

3327 Klinkowski, M. & Schmelzer, K.
Beiträge zur Kenntnis des Virus der Tabak-Rippenbräune. (**Contributions to our knowledge of the tobacco brown vein virus**).
Phytopath. Z. 1957 : **28** : 285–306.
A virus occurring in tobacco plants in Germany and causing systematic necrosis accompanied by browning of the leaves was identified at the Institute of Pathology, Aschersleben, as a variant of potato virus Y and the designation *Marmor upsilon* var. *costaenecans* is proposed for it. Varietal differences in susceptibility to the virus were also observed (cf. *PBA,* XXV, Abst. 3214).

3328 Hitchborn, J. H.
The effect of high temperature on the multiplication of two strains of tobacco ring spot virus.
Virology 1957 : **3** : 243–44.
A difference has been detected between two antigenically related strains of the above virus in respect of their ability to multiply in tobacco plants at 36°.

Annual Report of the Tocklai Experimental Station of the Indian Tea Association 1955 : Pp. 159.

3329 *Wight, W. & Barua, P. K. Practical tea breeding.* (*pp. 40–44*).

Combination of the desirable qualities of the Assam type with adaptability to a wider range of conditions is being sought. Morphologically distinct plants selected from estates and from introduced material have been used in hybridzation. F_1 selections may prove suitable as parents for biclonal plantings for seed production but in some cases further crossing may be necessary to provide such parents. Information is given on the results of tasting tests of ten progenies which may be adapted to various conditions. Some progenies showed marked superiority in quality over the control.

3330 Wight, W. & Barua, P. K.
What is tea ?
Nature, Lond. 1957 : **179** : 506–07.

The authors discuss the tea-making possibilities of *Camellia* species other than *C. sinensis* and, describing evidence suggesting that hybrid populations may be in cultivation, question the validity of the definition of tea as used by the industry and trade. Experimental F_1 hybrids between *C. sinensis* var. *assamica* and *C. irrawadiensis* produce tea acceptable to the taster. The leaves of *C. irrawadiensis* are marked with numerous pellucid dots, corresponding to scleroids. Observations on hybrids and back crosses have led to the conclusion that the presence of such dots in plants presumed to be offspring of *C. sinensis* is an indication of introgression by *C. irrawadiensis* or another species with this feature. The so-called variety China or China Hybrid of *C. sinensis* is regarded as being of interspecific origin.

3331 Simura [Shimura], T. & Oosone [Osone], K.
(Studies on the fertilization of the tea plant).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 111–14. [Japanese].

During the course of this general study of fertilization and embryology in the tea plant it is noted that self pollen grows much more slowly in the style than foreign pollen.

3332 Tomo, N., Fuchinoue, Y. & Fuchinoue, H.
(Studies on self fertilization of the tea plant).
Chagyo Kenkyu Hokoku/Tea Res. J. 1956 : No. 7 : 14–20.

Tea is highly self incompatible, largely owing to inhibition of pollen-tube growth at the top of the ovary. Bud pollination, pollination of old flowers and hormone spraying accelerated the growth of pollen tubes in the style but did little to expedite growth in the ovary.

3333 Evstafjeva, V. A.
(Winter hardiness of the tea plant).
Agrobiologija (Agrobiology) 1956 : No. 4 : 56–61. [Russian].

Thea plants raised from seed set at Šaumjan, Krasnodar territory, and from seed originating from Soči proved hardier than seedlings raised from the seed imported from other districts.

3334 Tomo, N., Fuchinoue, Y. & Fuchinoue, H.
(On the relation between the hydrophilic colloids and cold resistance of the tea plant).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1956 : **25** : 107–08. [Japanese].

The relation between cold resistance and absorption of various dyes was examined for a series of Japanese varieties. Cold-resistant varieties are stated to absorb basic dyes such as malachite green more readily than susceptible varieties; the converse holds for acidic dyes such as eosin.

3335 **Twenty-second Annual Report of the Coffee Research and Experimental Station, Lyamungu, Moshi, Department of Agriculture, Tanganyika, for the 1955/56 season.** 1956 : Pp. 35.

The results of trials of clonal selections are given. Clone KP423, a selection of Kent, has averaged 16·95 cwt. of clean coffee per acre over its first nine years of bearing. Other Kent selections are also giving high yields. Selections have in general so far produced higher yields under the multiple-stem system of pruning than under the single-stem system. According to records for the initial three years, clonal progenies give higher yields than first and second generation seedlings of the corresponding clones and seedlings of the original parents.

3336 Gude, C. J.
Resultaten van Robustatoetsproeven op de onderneming Gunung Gumitir en in de Proeftuin Sumber Asin. **(Results of trials of Robusta coffee on the Gunung Gumitir estate and at the Sumber Asin Experimental Station).**
Bergcultures 1957 : **26** : 19–28.

As the result of trials carried out at the above localities in eastern Java, the seedling families BP369 x BP368, BP358 x BP42, SA24 x BP42 and SA34 x BP42, together with their reciprocal

crosses, are recommended for large-scale planting in Java. The clones SA203, SA237 and SA333 are recommended for planting on a reduced scale.

3337 Carvalho, A.
O café selvagem da Abissínia. (**The wild coffee of Abyssinia**).
Bol. Suptda. Serv. Café, S. Paulo 1956 : **31** : No. 351 : 13–15.

Information, based on a report by P. Sylvain for FAO, is given concerning the conditions of soil, temperature and climate in the areas of Ethiopia where coffee is found wild. All specimens found belonged to the species *Coffea arabica*; a group with persistent calyx is thought to be the most primitive form of *C. arabica* and displays resemblances with the Bourbon type. Some of the specimens have proved resistant to *Hemileia*.

3338 **Report to the Government of Sudan on coffee production.**
FAO UN, Rome 1956 : No. 566 : Pp. 15. (Mimeographed).

The report includes information on the wild coffees (*Coffea canephora, C. excelsa* and *C. arabica*) found in the Sudan; an indication of their possible value for breeding is given. The performance of introduced species and varieties is also described. A complete survey of native coffee in order to obtain material for a future long-term project of breeding is recommended, together with the testing of new introductions.

3339 Costa, A. S. *ET AL.*
Bacterial halo blight of coffee in Brazil.
Phytopath. Z. 1957 : **28** : 427–44.

A new bacterial disease recently discovered on *Coffea arabica* in the state of São Paulo, Brazil, is described. Designated halo blight, it attacks the leaves and is caused by a species of *Pseudomonas* that is apparently closely related to *P. tabaci*. Observations made in April 1956 indicated that there were some differences in susceptibility among the varieties grown in São Paulo; Yellow Caturra, followed by Red Caturra, were significantly more resistant than the Bourbon types.

3340 Bock, K. R.
Investigations on coffee berry disease —laboratory studies.
E. Afr. agric. J. 1956 : **22** : 97–103.

The paper includes an account of investigations on host reaction to *Colletotrichum coffeanum*. The actively spreading type of lesion and the so-called scab lesion, produced in the field by susceptible and resistant hosts respectively, are also developed in tests on detached berries; assessment of varietal reactions under field conditions is therefore possible by testing in the laboratory. The greater susceptibility of varieties at higher altitudes is attributed primarily to an effect upon the host.

3341 **Annual Report of the West African Cocoa Research Institute 1955-56** (1957) : Pp. 90.

New hybrid selections in the trial planted in 1952 appear to have larger beans than their Upper-Amazon parents. Genetical study of incompatibility continued. Induced polyploids of *Theobroma cacao* and other species were investigated (cf. Abst. 2103). The identities and efficiency of pollinating insects are being determined. Preliminary results from hand pollinations suggest that the stigma is receptive along its whole length and not merely at the divided apex.
Investigations on tolerance and resistance of progenies of the Iquitos type T17 to the New Juaben virus are in progress.

3342 Mora Urpí, J.
Origen y tipos de cacao. (**Origin and types of cacao**).
Suelo tico 1956 : **9** : 196–200.

The conflicting views of authors such as Cheesman, Holdridge and Pittier concerning the origin of cultivated cacao are reported and descriptions are given of the types Criollo, Amazonian Forastero, Trinitario (with groups Angoleta, Cundeamor, Amelonado and Calabacillo), *Theobroma pentagona* and *T. leiocarpa*. The high degree of heterogeneity of these types and the overlapping between them are pointed out, reference being made for instance to forms of Calabacillo with white seeds and Criollo with purple seeds.

3343 Desrosiers, R.
Diferenciación entre variedades de cacao con base a su susceptibilidad a la infección con *Ceratostomella fimbriata* (E. and H.) Elliot, en El Ecuador. [**Differentiation between cacao varieties on the basis of their susceptibility to infection by *C. fimbriata* (E. and H.) Elliot in Ecuador**].
Turrialba 1956 : **6** : 48–52.

Examinations of a collection of cacao varieties in Ecuador showed the susceptibility to *C. fimbriata* to be progressively greater as the resemblance to the Criollo type increased, all those of the Trinitario and Forastero types being relatively resistant.

3344 Blauwmaanzaad, 1957. (**Opium poppy, 1957**).
Landbouwvoorlichting 14 : Bijl. 2 : Ber. Rassenkeuze 1957 : No. 219 : unpaginated.
Data on yield, morphological characteristics and quality of the seed are presented for the varieties Emmabloem [Emma flower], Nobel [Noble] and Eckendorf 64/54. These varieties are those most commonly grown in the Netherlands.

3345 Kopp, E. & Kotilla, E.
Experienţe de ameliorare a macului alcaloidic. (**Experiments on improving the opium poppy**).
Stud. Cercet. şti., Cluj : Ser. 2 : 1955 : **6**: No. 3–4 : 57–60.
The morphine content of the opium poppy has been improved by individual selection. Some correlations between morphine content and morphological characteristics are noted.

3346 Zub, L.
Porównanie wartości odmian hodowlanych i populacji chmielu pochodzenia krajowego i zagranicznego w roku 1953. (**A comparison of the value of improved varieties and of populations of hops of local and foreign origin in the year 1953**).
Ann. Univ. M. Curie-Skłodowska 1955 : **10** : 193–219.
In Polish trials of native and Czechoslovakian material, Polish selections from local varieties were superior in productivity, quality and adaptation, but not in uniformity. Unimproved Polish races were highly variable and generally inferior to the Czechoslovakian material but included plants which should be of value in further breeding.

3347 Nečiporčuk, I. D.
(**Some facts concerning form development in the hop**).
Agrobiologija (Agrobiology) 1956 : No. 4 : p. 136. [Russian].
Instances of conversions of *Humulus lupulus* into a form resembling *H. cordifolius* and into an entirely new form are reported from Žitomir. The latter form has dissected leaves and arose from the old Ukrainian variety Zemševyĭ.

3348 Neve, R. A.
Polyploidy in hops.
Worcs. agric. quart. Chron. 1957 : **25** : 55–58.
Some of the advantages to be expected from the use of polyploid plants in hop breeding are discussed with reference to work in progress at Wye College. Tetraploid females of several varieties have been produced by colchicine treatment and their progeny are being evaluated.

3349 Davis, E. L.
Variation in cultivated varieties of *Humulus lupulus*, and its relation to the possible sources of these varieties.
Diss. Abstr. 1956 : **16** : Publ. No. 17,179 : p. 1566.
On the basis of the morphology of the cone and leaf, three complexes were distinguished, two of which consisted of varieties cultivated in Europe and the third of varieties in North America. Data on wild hops confirmed the distinctiveness of the American type. The genus is regarded as being composed of two species, *H. lupulus* and *H. japonicus*. It is suggested that information on wild forms is too incomplete for the precise delimitation of subspecies and varieties. Intraclonal morphological variation over a wide geographical range was found to be slight in a two-year study. The arrangement of cones upon the vines was highly variable, chiefly as the result of the influence of the environment; intervarietal differences in degree of clustering were however noted. It is postulated that hops were most probably grown in northeastern Europe and the Caucasus long before they were cultivated in western Europe.

3350 **Annual Report of Hop Research at the Cawthron Institute and Department of Scientific and Industrial Research, New Zealand, for 1955-56** : unpaginated.
Some new seedlings show promise of being resistant to root rot while being at least not inferior to the variety Californian in yield and quality.

MINOR CROP PLANTS

3351 Hristov, S.
(**Some of the principal problems of cultivating red pepper for grinding**).
Selskostopan. Misăl 1956 : No. 4 : 220–22. [Bulgarian].
Plovdivski Ljut [Plovdiv Pungent], a high-yielding early variety, has recently been bred at the Marica Agricultural Institute. It outyields Černe Ljut [Black Pungent] and other high-quality Bulgarian varieties which in the 1953–1955 trials at Plovdiv proved more productive than varieties from Hungary.

3352 Angeli, L.
Paprikafajták előállitása, fenntartása és értékelése. (**The production, maintenance and evaluation of sweet-pepper varieties**).
Kertész. szőlész. Főiskol. Évkön. 1954 : **1** : 3–23.

Within the three white-fleshed capsaicin-free varieties Cecei csüngő [Cece Pendulous], Cecei felálló [Cece Erect] and Tétény, selected from local strains at the Nagytétény Experimental Farm, Hungary, high-yielding lines giving fruits of good quality with vitamin C contents of 70–100 mg. % have been obtained. Tétény was the earliest and the most resistant to scorching due to sun.

3353 Hare, W. W.
Inheritance of *Cercospora* resistance in pepper.
Phytopathology 1957 : **47** : p. 15. (Abst.).

From the results of crosses and back crosses involving 46101 from Para, Brazil, and Truheart and California Wonder peppers it is concluded that resistance to *Cercospora* leaf spot is controlled by several gene pairs.

3354 Hare, W. W.
Comparative resistance of seven pepper varieties to five root-knot nematodes.
Phytopathology 1956 : **46** : 669–72.

The responses of seven varieties of *Capsicum frutescens* to *Meloidogyne incognita*, *M. incognita* var. *acrita*, *M. javanica*, *M. arenaria* and *M. hapla* have been determined at Mississippi State College. Early California Wonder was moderately resistant to *M. javanica*, Oakview Wonder, 4795B Peru, Red Chili and PI 135824 were resistant to *M. javanica* and *M. arenaria*, the latter two varieties also possessing moderate resistance to *M. incognita* and *M. incognita* var. *acrita*, and Santanka xS and 405 B Mexico were resistant to all species except *M. hapla*, to which all seven varieties were susceptible.

3355 Kormos, J. & Kormos, J.
A paprikatermés szín- és mirigyváltozatai. (**Variations in colour and glands in red pepper fruits**).
Növénytermelés 1956 : **5** : 141–52.

The main types of pigment found in fruits of different colours are listed. In crosses of green and brown-fruited peppers, the carotenoid composition of the latter parent was dominant over that of the former. Crosses between varieties with hard green fruits and those with soft yellow fruits showed that hardness and green colour were each conditioned by a single recessive gene. Soft green peppers ripening at the same time as red and yellow varieties and equally suitable for canning have been developed. The carotenoids of the glands associated with the veins of the fruit differ from and are inherited independently of the carotenoids of the other fruit tissues. The ether extract from the glands of the fruits of pungent varieties contained about four times as much lipoid material, capsaicin and unidentified pungent material as that from nonpungent fruits.

3356 Andersson, G.
Svalöfs original Arlo vårrybs. (**The Svalöf original spring turnip rape Arlo**).
Allmänna Svenska Utsädesaktiebolaget Svalöf 1957 : 8–10.

Arlo, developed by mass selection from crosses between an early strain of the German variety Mettes and semiearly strains from Tábor, Czechoslovakia, resembles Gute in appearance and in earliness (cf. *PBA*, XXI, Abst. 139) but gives 3% higher yield and contains 5% more oil.

3357 Székács, J.
A ricinus fajtakérdése magyarországon. (**The varietal problem with regard to the castor oil plant in Hungary**).
Agrártudomány 1955 : **7** : 116–19.

The new varieties Széhács-féle tüskenélküli [Széhács's Spineless] and Iregi korai [Ireg Early] are early enough to give good yields in districts north of 47° N., which is normally the northern limit of cultivation of the castor oil plant in Hungary.

3358 Hanawa, J.
The embryo sac formation and the embryogeny of *Sesamum indicum* L. in the diploid and the tetraploid strains.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1953 : **66** : 98–102.

It is noted in the course of this embryological investigation that $4n$ embryos develop more slowly than $2n$ embryos.

3359 Poole, D. D.
Strain differences in *Pseudomonas sesami* and the effect of a secondary organism on symptom expression on sesame.
Phytopathology 1957 : **47** : p. 27. (Abst.).

Isolates of *Ps. sesami* have been found to fall into three groups distinguished by their virulence on a set of differential varieties.

3360 Kondakov, N. A.
(Initial material for breeding flax derived from the Čainskiĭ land race).
Lën i Konoplja (Flax & Hemp) 1957 : No. 2 : 25–27. [Russian].

Forms different with regard to straw and seed yields, growth period and habit have been selected from the Čainskiĭ population at Tomsk. Some families distinguished by high seed yield, earliness and short straw were found to be useful breeding material. $G503_4$ (T2 x Čainskiĭ 36) x $G354_1$ is among the best new hybrids. It produces 26·1% more fibre and 35·3% longer fibre than the standard 1288_{12} and shows improved resistance to lodging.

3361 Pandey, K. K.
Studies in autotetraploids of linseed (*Linum usitatissimum* L.). II. Morphology and cytogenetics.
Lloydia, Cincinnati 1956 : **19** : 245–68.

C_2 tetraploids showed a general increase in size of plant parts, compared with diploids (cf. Abst. 2126). Most of their seeds were however empty and shrivelled. The fibre bundles in the stems of the tetraploids were reduced in size and separated from one another, with the cells loosely arranged, whereas in the diploids the bundles were compact and confluent. Crosses between tetraploids and diploids in either direction were highly incompatible. About 47% of the C_2 generation consisted of aneuploids of which only plants with $2n = 58$ produced a few seeds. Sterility in the tetraploids is ascribed to (1) meiotic abnormalities in the pollen mother cells, (2) failure of the majority of the embryo sacs to reach the 8-nucleate stage, (3) the defective mode of anther dehiscence observed in some plants, (4) failure of a proportion of the apparently viable pollen grains to germinate and (5) abnormality in pollen-tube growth. It is postulated that a sporophytic system of partial self incompatibility may be operative in autotetraploid linseed.

3362 Singh, D., Mital, S. P. & Gangwar, L. C.
Breeding for wilt resistance in linseed (*Linum usitatissimum* L.) in Uttar Pradesh.
Indian J. Genet. 1956 : **16** : 29–31.

The variety NP (RR) 9 has been found to possess good resistance to *Fusarium oxysporum* f. *lini* and is being used in a breeding programme designed to develop high yielding, wilt resistant varieties. The material has now reached the F_3 and resistance has been shown to be controlled by a single dominant factor.

3363 Ashley, T. E.
Wide range of tests for South Mississippi area.
Miss. Fm. Res. 1956 : **19** : No. 10 : p. 1, 3.

An intensive tung breeding programme is under way at the South Mississippi Branch Station designed to develop a later flowering variety which would escape damage by spring frosts.

3364 Long, R. W. (Jun.)
A cytological analysis of a naturally occurring *Helianthus* hybrid.
Ohio J. Sci. 1957 : **57** : 65–69.

The degree of chromosome homology and pollen fertility in *H. salicifolius* x *H. grosseserratus* indicated that the two species are closely related. Inclusion of *H. salicifolius* in sect. *Giganteus* is suggested.

3365 Putt, E. D. & Sackston, W. E.
Studies on sunflower rust. I. Some sources of rust resistance.
Canad. J. Pl. Sci. 1957 : **37** : 43–54.

This paper forms an extended version of that already summarized in *PBA*, XXVI, Abst. 610. Six selections have been found to possess rust resistance at the Experimental Farm, Morden, Manitoba. They are: 953–88, from open pollinated F_1 plants of Sunrise x Texas Wild Annual; 953–102, from open pollinated F_1 plants of California Oilseed x Texas Wild Annual; 307, from open pollinated Hope; 306, from open pollinated F_1 plants of Hill Sunrise x Wild; 355, from a rust-free open pollinated plant of Red 6; and 403, 537–388 x Sunrise. It is thought that rust resistance in each case is derived from wild *Helianthus annuus*.

3366 Horowitz, B. & Winter, G.
A new safflower with a low iodine value.
Nature, Lond. 1957 : **179** : 582–83.

A variant yielding an edible type of oil, with an iodine value of 90–100, 74–79% oleic acid and 11–19% linoleic acid, has been selected at the Waite Agricultural Research Institute, South Australia, from an Indian variety. The plants are spineless, 50–60 cm. high and normal in chromosome number. Data from crosses between normal safflower and the variant suggest that iodine value may be controlled by a single gene.

3367 **Fourth Annual Report of the West African Institute for Oil Palm Research, 1955-56** : Pp. 120.

At the main station near Benin and at the substation at Abak, nurseries of *dura* x *dura* and *tenera* x *tenera* material from Ufuma and Aba were established. Mother-tree selection and

pollination, to provide further material for testing at the main station and Abak substation, continued at Umudike and Nkwele (cf. *PBA*, XXVI, Abst. 2735).

Modifications have been made in the criteria used in selecting seed trees of the *dura* and *tenera* types, so as to obtain fruit containing a high percentage of not only mesocarp but also kernel.

Dura palms were crossed and selfed with a view to determining the inheritance of fruit colour in the *rutilo-nigrescens*, *rubro-nigrescens* and *virescens* types and of the mantle character in the *poissoni* type. Two externally indistinguishable types of *virescens* palm have been identified by pigment analysis of the oil. They give colorimetric readings similar to those of the types from which they were respectively derived, viz. *rutilo-nigrescens* and *rubro-nigrescens*.

Selfed progenies of palms with the *idolatrica* type of leaf consisted of the *idolatrica*, intermediate hybrid and ordinary types. The first and third types are respectively assumed to be homozygous dominants and recessives.

3368 Fowler, R. L.
The West African Institute for Oil Palm Research.
Bol. téc., Bahia 1956 : **3** : No. 2 : 49–57.

For the benefit of Portuguese readers, an account is given of the activities of the institute, special reference being made to the method of performing hybridization, and to inheritance studies designed to combine the characters *tenera* and dumpy.

3369 Pichel, R.
L'amélioration du palmier à huile au Congo belge. (**Oil palm breeding in the Belgian Congo**).
Bull. agric. Congo belge 1957 : **48** : 67–76.

An historical account of breeding work carried out on oil palms at Yangambi since the introduction of this crop into the Belgian Congo in 1922 is presented and current breeding work, including the selection of élite mother trees and the carrying out of *dura* x *dura*, *dura* x *tenera* and *dura* x *pisifera* crosses, is outlined. *Dura* x *pisifera* crosses give 98–100% *tenera* palms.

3370 D'Amato Avanzi, M. G.
Attuali conoscenze sulla citotassonomia del genere *Cassia* (Caesalpiniaceae-Cassieae). [**Present knowledge on the cytotaxonomy of the genus *Cassia* (Caesalpiniaceae-Cassieae)**].
Caryologia 1956 : **9** : 166–73.

Chromosome numbers, some from the literature and some determined by the author herself, are reported for a large number of species of *Cassia*, from which it is seen that species with $x = 6, 7$ and 8 and $x_2 = 13$ exist. All species of section *Chamaecrista* have $2n = 16$ and it is suggested that this section should be elevated to a genus. Several anomalies resulting from inaccuracy in taxonomy or in chromosome counting are pointed out.

3371 Cramer, P. J. S.
The rubber production in the Dutch East Indies.
Arch. Rubb. Cult. 1956 : **33** : 259–344.

Cramer, P. J. S.
Half a century of the rubber planting industry in Indonesia.
Ibid. 1956 : **33** : 345–59.

In these two articles, written in 1940 and 1949 but not previously published, the author reviews the development of the rubber industry in Indonesia and the improvements resulting from seed selection, selective thinning and the propagation of superior clones.

3372 Institut des Recherches sur le Caoutchouc en Indochine. Rapport Annuel 1955. (**Institute of Research on Rubber in Indochina. Annual Report, 1955**).
Laikhê 1956 : Pp. 210. (Mimeographed).

Information is provided on breeding work and clonal trials at experimental stations in Viêtnam and Cambodia, including the Laikhê, Giaray and Bugno-Bara Experimental Stations. PR107 is still the best of the clones grown on a large scale in Indochina and also possesses the advantage of being highly resistant to drought. A number of recently introduced IRCI clones tested at Tapao in the last few years have, however, consistently outyielded PR107. Good results have been obtained from several legitimate and illegitimate seedlings (cf. *PBA*, XXVI, Abst. 1648) and among these seedlings, the progeny of the cross IRCI6 x PR107 were outstanding. A number of new stocks suitable for grafting have also been developed.

3373 **Planting recommendations, 1957-8.**
RRI Plant. Bull. 1957 : No. 28 : 10–14.

A list is given of recommended clones for large or moderate scale planting in Malaya, together with descriptions of each clone and the type of latex it produces.

3374 Fujita, Y.
(**The various relations between the specific characteristics, chemistry and distribution of the camphor tree and related species**).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1952 : **65** : 245–50. [Japanese].

The taxonomic relations, terpene composition

and geographical distribution of *Cinnamomum camphora, C. nominale, C. micranthum* and *C. kanahirai* are discussed and a tentative phylogenetic scheme connecting the species is proposed.

3375 Delhaye, R. J.
Note préliminaire sur la biologie florale et sur la fécondation dirigée du pyrèthre, *Chrysanthemum cinerariaefolium* (Trev.) Bocc. [**Preliminary note on the floral biology and controlled fertilization of pyrethrum, *C. cinerariaefolium* (Trev.) Bocc.**].
Bull. agric. Congo belge 1956 : **47** : 1327–43.

The results of preliminary studies on the floral biology of *C. cinerariaefolium* are reported. This species is highly self fertile but a somewhat higher seed set and a slightly higher percentage of viable seeds are obtained when pollen from another clone is used. Emasculation techniques employed in hybridization work are described. Favourable results have been obtained by interclonal hybridization.

FRUITS AND NUTS

3376 Årsoversikt over Forsøksvirksomheten i hagebruk i 1955. (**Annual survey of experimental work on horticulture in 1955**).
Oslo 1955 : Pp. 82. (Mimeographed).

Information is given on varieties of fruit and vegetables taking part in trials of yield and resistance to various disorders at experimental stations in Norway.

3377 Kobel, F.
Jahresbericht 1954/1955 der Eidg. Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil. (**Annual report for 1954-55 of the Federal Experimental Station for Viticulture and Horticulture at Wädenswil**).
Landw. Jb. Schweiz 1956 : **5** : 855–956.

In addition to the following, brief information is given on the selection of new vegetable varieties and the results of trials of fruit trees, soft fruits and vegetable varieties are discussed.

Apple. The performance of new varieties resulting from experimental crosses is reported. The new variety Schweizer Orangenapfel [Swiss Orange apple] has given good results (cf. *PBA*, XXVI, Abst. 1670). The keeping qualities of a number of varieties were compared.

Cherry. New, large-fruited cherry varieties are being developed by a programme of intervarietal crossing.

Raspberry. The new variety Andenken an Paul Camenzind [Souvenir of Paul Camenzind] has given high yields of good-quality fruit in recent trials (cf. *PBA*, XXVI, Abst. 1670) but has proved ill-adapted to damp soils or soils with a high lime content. Some large-fruited lines producing fruit of good quality have been obtained by crossing the large-fruited American variety Willamette with the English variety Malling Promise.

3378 Luh [Lu], C.-L.
Recent improvement on pineapple and citrus fruit production in Taiwan.
Pl. Indust. Ser. Chin.-Amer. Joint Comm. rur. Reconstr., Taiwan 1956 : No. 8 : Pp. 28.

An account is given of recent work on the selection, varietal purification and breeding of pineapple and citrus fruits.

3379 Blasse, W.
Martin Schmidt—Leben und Werk. (**Martin Schmidt, life and work**).
Wiss. Z. Humboldt-Univ. Berlin 1955–56 : **5** : 231–43.

This obituary notice includes a detailed account of the work of the German fruit-tree breeder M. Schmidt and descriptions of some of the varieties of pome, stone and soft fruits developed by him.

3380 Prezent, I. I.
(**The theoretical views and methods of work of Luther Burbank**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. biol. : 1956 : No. 4 : 121–28. [Russian].

The thesis of this lecture is that in spite of his making no mention of it in his writings and in spite of his use of millions of seedlings in the production of one successful combination of characters, Burbank was in point of fact applying the principle of environmental training later formulated by Mičurin.

3381 Lozovskiĭ, T. A.
(**Introducing the best local varieties of fruit trees in orchards**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 10 : 34–36. [Russian].

Descriptions are given of the apple variety Tavlinka, the pears Šeršavska [Rough-skinned] and Petrovka, the apricot Kuraga Rogožina [Rogožin's Kuraga], the plum Černosliv Kavkazskiĭ [Caucasian Prune], the cherry Priusadebnaja Kavkazskaja [Caucasian Homestead], the peach Šaftalju and the fig Terek, selected among the local material in the Grozno province. They are all productive and the flavour of their fruits

is good. The plum and cherry are notable for their transportability and the apricot is tolerant of variable winter temperatures. The fig variety crops twice a year and the fruits are eaten fresh or dried.

3382 Kovalev, N. V.
(The origin of species of fruit trees by hybridization).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 387–89. [Russian].
Hybrid pome and stone fruits from the Caucasus, central Asia and the Far East provide the basis for a discussion of evolutionary problems (cf. *PBA*, IX, Abst. 1599, XXV, Abst. 2334 and XXVI, Abst. 1734). It is thought that new hybrid forms of two distinct kinds arise. Some can cross with the parental species and may be swamped by continued hybridization with them. Under certain conditions a new species may evolve from hybrid forms of this kind. Others cannot cross with the parental species and are not swamped by them. In this case a new species may evolve fairly quickly from the hybrid forms.

3383 Karnatz, H.
Untersuchungen über die Frostresistenz der Obstgehölze im Baumschulstadium. III. Über die relative Frosthärte unveredelter Kernobstunterlagen. **(Studies on the frost resistance of fruit trees in the nursery stage. III. On the relative frost hardiness of ungrafted pome fruit stocks).**
Züchter 1956 : **26** : 307–15.
Varietal differences in the winter hardiness of a number of apple and pear seedlings intended for use as rootstocks are noted. In intervarietal crosses, frost resistance was polygenically determined and in many cases appeared to depend partly on cytoplasmic factors. An association was observed between frost resistance and growth vigour.

3384 Hoffmann, P.
Prüfung ausländischer Kernobstsorten auf ihre Anbaueignung in Mitteldeutschland. **(Testing foreign pome fruit varieties as to their suitability for cultivation in Central Germany).**
Wiss. Z. Martin-Luther-Univ. Halle-Wittenberg 1955/56 : **5** : 1217–28.
Tabulated data are provided on the yield, time of flowering and ripening, quality of the fruit and resistance to diseases, insect pests and frost of some 60 apple and 3 pear varieties from North America, Europe and the USSR tested as to their suitability for cultivation in central Germany.

3385 Bishop, C. J.
Genetic changes in apples induced by thermal neutrons.
Canad. J. Pl. Sci. 1957 : **37** : 55–58.
"Sectorial colour changes in Cortland apples showed a marked increase over controls following irradiation of the dormant scions with 2–8 hours' exposure to thermal neutrons. This type of atomic radiation appeared to be much more effective than were x-rays in producing gene mutations. Both sectorial and complete colour sports were found, the latter being very dark red and readily distinguishable from the colour of the normal Cortland. About 5 hours' exposure with a thermal neutron dosage of about 13 x 10^{12} neutrons per cm^2 appeared to be the optimum treatment for this apple variety."
[Author's summary]

3386 Sadamori, S., Murakami, H., Suzuki, H. & Ishizuka, S.
(Newly bred apple strains).
Tohoku Nogyo Shikenjo Kenkyu Hokoku/Rep. Tohoku agric. Exp. Sta. 1955 : No. 4 : 125–28. [Japanese].
Forty-two crosses have been made, from which six promising hybrids have been obtained: Tohoku 1 [North-eastern 1] (Early McIntosh x Williams), Tohoku 2 (McIntosh x Worcester Pearmain), Tohoku 3 and 4 (Jonathan x Worcester Pearmain) and Tohoku 5 and 6 (Kokuko x Jonathan).

3387 Dickson, G. H.
The Jonathan apple, a valuable parent.
Fruit Var. hort. Dig. 1956 : **11** : p. 25.
Attention is briefly drawn to the value of Jonathan as a parent, as shown by breeding at the Vineland Horticultural Experiment Station, Ontario.

3388 **The Starkrimson (Bisbee strain) Delicious apple.**
Fruit Var. hort. Dig. 1956 : **11** : p. 31.
The fruits of Starkrimson, a bud sport of Starking Delicious, have an unbroken red colour, in contrast to the red striping of those of the parent variety. Even when overmature, they retain their glossiness. The sport is smaller in size than a standard tree and tends to develop an extensive spur system, to come into bearing earlier and to be more productive than other varieties of the Delicious type.

3389 KLEIN, L. G. & EINSET, J.
Performance of newer apple varieties in New York.
Fruit Var. hort. Dig. 1956 : **11** : 23–25.
The following varieties are discussed: Wellington, Beacon, Webster, Graham, Monroe, Fyan, Idared and Jerseyred.

3390 KARAMYŠEVA, V.
(**Mičurin apple varieties in the northwestern zone of the USSR**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 10 : 41–42. [Russian].
Mention is made of new seedlings of Beljfler Kitaïka [Bellflower crab] selected for large fruit, fine flavour and late maturity at the Institute of Plant Industry. The fruit of Leningradskaja Zelenka [Green Leningrad] keeps till June.

3391 CARLONE, R.
Influenza del diverso momento d'impollinazione sull'allegagione e sulla crescita del tubulo pollinico nel melo *Golden Delicious*. (**Influence of different times of pollination on fruit set and on pollen-tube growth in the apple Golden Delicious**).
Genet. agr. 1956 : **6** : 3–16.
Experiments are described which show that equally good sets of fruit were obtained when flowers of Golden Delicious were pollinated with pollen from Delicious at the time of anthesis or a day or two before or after.

3392 MALIGA, P.
Befruchtingsverhältnisse des Jonathanapfels. (**Fertilization relationships of the Jonathan apple**).
Acta agron., Budapest 1956 : **6** : 287–305.
Data are presented on the compatibility relationships and flowering times of Jonathan and some 30 other varieties grown in Hungary.

3393 NESTEROV, JA. S.
(**The role of maternal pollen in intervarietal pollination of the apple**).
Agrobiologija (Agrobiology) 1956 : No. 4 : 132–34. [Russian].
At the Maïkop branch of the Institute of Plant Industry a few varieties were cross pollinated with another variety or were fertilized by the other variety + self pollen. Tabulated information showing the fruit set, fruit weight and quantity and viability of the seed from both modes of pollination is presented. The addition of self pollen to foreign pollen was beneficial to most varieties in all the above-mentioned respects.

3394 STOLLE, G.
Einjährige Untersuchungen über den Nährstoffgehalt der Blätter von Apfelbäumen verschiedener Sorten, Unterlagen und Standorte. (**One-year studies on the nutrient content of the leaves of apple trees of different varieties, rootstocks and localities**).
Arch. Gartenb. 1956 : **4** : 151–64.
At the Institute for Fruit Cultivation and Breeding, Marquardt, Eastern Germany, type of soil and locality were found to affect the nitrogen, phosphoric acid, potassium and calcium contents of the leaves of young apple trees. Rootstock exercized little influence. Significant varietal differences were observed only in nitrogen and potassium contents.

3395 VAN DER PLASSE, J. B.
Bewaarmogelijkheden van de belangrijkste appelrassen. (**Storage potentialities of the most important apple varieties**).
Fruitteelt 1957 : **47** : 30–31.
Information is provided on the keeping properties of nine varieties grown in the Netherlands.

3396 TJAŽELJNIKOV, A. D.
(**In Siberia and central Asia. Training apple hybrids in different climates**).
Nauk. pered. Opyt seljsk. Hozjaïstv. (Sci. progr. Exp. Agric.) 1957 : No. 2 : 35–38. [Russian].
The hardy large-fruited varieties Tomič [Tomsk Dweller] (Purple Reinette x Borovinka), Hybrid 24 (Purple Reinette x 600 g. Antonovka) and Hybrid 32 (Purple Reinette x Beljfler Kitaïka [Bellflower crab] have been bred at Tomsk, using the method described in *PBA*, XXII, Abst. 1377. All these are distinguished by high yield and fine quality. Tomič produces the largest fruits, weighing up to 80 g. The others show resistance to diseases, in particular to scab.

3397 SCHMIDLE, A.
Über Infektionsversuche an Apfelbäumen mit *Phytophthora cactorum* (Leb et Cohn) Schroet., dem Erreger der Kragenfäule. [**On experiments on infecting apple trees with *Ph. cactorum* (Leb. et Cohn) Schroet., the agent of collar rot**].
Phytopath. Z. 1957 : **28** : 329–42.
Varietal differences in the susceptibility of a number of apple varieties and rootstocks to infection by *Ph. cactorum* are noted. Jonathan, Golden Delicious and James Grieve showed a high degree of resistance but Transparent von

Croncels [Croncels Transparent], Berlepsch and Cox's Orange Pippin proved extremely susceptible. No differences in virulence were found between samples of *Ph. cactorum* of different provenance and the degree of virulence of the pathogen on apple trees was the same irrespective of whether the inoculum had been obtained from infected apple or apricot trees or from strawberries.

3398 TEN HOUTEN, J. G.
Hoe staat het met de vatbaarheid van appelrassen voor stambasisrot? (What is the position as regards the susceptibility of apple varieties to stem rot ?)
Fruitteelt 1957 : **47** : 155–58.

Information is given on the reaction of some 30 varieties to infection by *Phytophthora cactorum* and *Ph. syringae*. Choice of rootstock was important and data are also provided on the degree of resistance of a number of East Malling stocks.

3399 LESJUK, E. A.
(Apple varieties bred by I. S. Gorškov).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 10 : 36–38. [Russian].

A number of varieties characterized by good quality, hardiness, high yield and resistance to *Venturia* from Mičurinsk are described.

3400 MAKSIMOVA, M. P. & GIDAJATLY, Z. A.
(New apple varieties for the Azerbaijan SSR).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 10 : 39–40. [Russian].

A number of new large-fruited high quality apple varieties notable for high yield have been bred at Kuba, Azerbaijan. Most are late-ripening forms with good keeping properties, in particular Ag Reinette [White Reinette] (Sary Turš [Yellow Turš] x Champagne Reinette), which keeps till June; several show resistance to *Venturia*.

3401 SPANGELO, L. P. S., JULIEN, J. B., RACICOT, H. N. & BLAIR, D. S.
Breeding apples for resistance to scab.
Canad. J. agric. Sci. 1956 : **36** : 329–38.

The apple breeding programme carried out jointly by the Horticulture Division, Experimental Farms Service and the Botany and Plant Pathology Division, Science Service of the Canada Department of Agriculture at the Horticultural Substation, Smithfield, Ontario, is briefly reviewed. Sources of resistance to *Venturia inaequalis* include R12740–7A, a selection from *Malus pumila* and selections from the crosses Jonathan x [(Rome Beauty x *M. floribunda*) sib], Wolf River x *M. atrosanguinea*, Wolf River x *M. prunifolia* and Wealthy x *M. prunifolia*. Results obtained so far indicate that modifying factors for resistance may be contributed by a susceptible parent and that progeny from crosses involving resistant selections from *M. atrosanguinea* and *M. prunifolia* are superior to those involving *M. floribunda*. The fruit quality of scab-resistant seedlings is being improved by back crossing with seedlings of *M. baccata* x commercial varieties.
It has been found that reaction to *V. inaequalis* is not linked with reaction to *Podosphaera leucotricha* and it is hoped to develop varieties possessing some degree of combined resistance.

3402 KLINE, D. M.
Studies on the pathogenicity of certain induced biochemical mutants in *Venturia inaequalis* (Cke.) Wint.
Diss. Abstr. 1956 : **16** : Publ. No. 16,182 : 984–85.

Further evidence has been obtained that the nonpathogenicity of certain biochemical mutants is due to their specific deficiencies and that pathogenicity may usually be restored by addition of the required nutrients to the surface of inoculated leaves of apple (cf. *PBA*, XXVI, Abst. 2099).

3403 DAY, P. R., BOONE, D. M. & KEITT, G. W.
***Venturia inaequalis* (Cke.) Wint. XI. The chromosome number.**
Amer. J. Bot. 1956 : **43** : 835–38.

Cytological studies have shown that the haploid chromosome number of *V. inaequalis* is seven and that synapsis occurs before maximum extension is reached. A provisional report of the same number for *V. pirina* is also given.

3404 BART, G. J.
Susceptibility of non-oak species to *Endoconidiophora fagacearum*.
Phytopathology 1957 : **47** : p. 3. (Abst.).

Delicious apples have proved less susceptible than Jonathan to *E. fagacearum*.

3405 ČIŽOV, S. T.
(The basis of breeding pears for the central nonchernozem zone of the RSFSR).
Izv. Timirjazev. seljskohozjaĭstv. Akad. (News Timirjazev agric. Acad.) 1956 : No. 3 : 237–38. [Russian].

Breeding high-quality varieties hardy under central Russian conditions, in particular the

work now in progress at the Timirjazev Agricultural Academy, is described and the value of various components for crosses likely to produce hybrids with the desired characteristics is discussed. Varieties bred by Lukašev in the Far East, which derive their hardiness from *Pyrus ussuriensis* and *P. sylvestris*, are regarded as specially valuable and have been used extensively for crossing with Mičurin, central Russian and southern European varieties. Reference is made to new Siberian varieties notable for high quality and hardiness, among them seedlings 3–2–5, 3–4–5 and 6–5–1 from Čeljabinsk. All these were obtained by crossing *P. ussuriensis* with Clapp's Favourite.

3406 Vlasov, M. V.
(A quince from Maksatiha).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 10 : 76–77. [Russian].

A hardy seedling raised from seed of unspecified origin at Maksatiha, Kalinin province, is described; it shows resistance to drought, pests and diseases.

3407 Valdeyron, G. & Crossa-Raynaud, P.
Contribution à l'étude du régime de la fécondation chez l'abricotier. **(Contribution to the study of the system of fertilization in the apricot).**
Ann. Inst. nat. Rech. agron., Paris : Sér. B : 1956 : **6** : 217–38.

The results of studies carried out in Tunisia on eleven varieties of Tunisian, Spanish and North American origin are reported. Six of the varieties, in the main early-maturing Tunisian forms, were found to be self incompatible; the other varieties set more fruit when cross pollinated than when self pollinated. Self incompatibility appears to be due to inhibition of pollen-tube growth in the stigmas or, in one case, to the production of defective pollen. Self-incompatible varieties tended to be more vigorous than self-compatible ones. Intervarietal hybridization indicated that compatibility between varieties was genetically controlled. Details are given of the breeding programme at present being carried out in Tunisia. The main objective is the development of early-maturing varieties producing high-quality fruit suitable for canning; it is hoped to achieve this aim by crossing early-maturing Tunisian forms with varieties from the USA.

3408 Čistjakov, A. I.
(An apricot from Čerepovec).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 10 : p. 76. [Russian].

A seedling raised from a stone originating from Vladivostok produced high-quality fruits and proved hardy under the conditions of Čerepovec. It is thought to be valuable for breeding hardy varieties for even more northerly districts of Russia.

3409 Matzner, F.
Der Bitterstoffgehalt der Aprikosenkerne als Sortenmerkmal und als natürlicher Schutz gegen Eichhörnchenschäden. **(The alkaloid content of apricot kernels as a varietal characteristic and as a natural protection against damage by squirrels).**
Arch. Gartenb. 1956 : **4** : 211–17.

The flavour of the kernels of a number of apricot varieties was studied and varietal differences in amygdalin content were found. It is suggested that attention be paid to the degree of bitterness of the kernels in future breeding work and in the selection of varieties for planting as it is thought that the bitter taste will discourage squirrels.

3410 Marinov, P.
(Cultivating the plum in montane and submontane districts).
Selskostopan. Misăl 1956 : No. 4 : 223–30. [Bulgarian].

Data showing maturation dates, self and cross fertility, biochemical properties and resistance to *Polystigma rubrum* of a number of Bulgarian varieties, together with information on whether the fruit is eaten in the fresh or dried state or is suitable for canning and alcohol manufacture, are presented.

3411 Sonea, V.
Contribuţii la studiul pomologic şi tehnologic al corcoduşului din R.P.R. (*Prunus cerasifera* Ehrh.). [**Contributions to the pomological and technological study of the myrobalan (*P. cerasifera* Ehrh.) in the Rumanian People's Republic**].
Anal. Inst. Cerc. agron. Român. 1954–1955 (1956) : **23** : No. 4 : 307–34.

Some 300 provenance types have been collected in Rumania and these are being classified in respect of such characteristics as fruit quality and maturation period.

3412 Callahan, K. L. & Moore, J. D.
Prunus host range of elm mosaic virus.
Phytopathology 1957 : **47** : p. 5. (Abst.).

Details are given of the reactions of 28 species and varieties of *Prunus* to artificial inoculation with elm mosaic virus. Half of those tested, including Kwanzan and Shirofugen, were not affected while English Morello, Montmorency

and *P. besseyi* were found to be symptomless carriers.

3413 Teterev, F. K.
(Northern sweet cherry).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) 1956 : No. 1 : 29–46. [Russian].
The substance of this article was summarized in *PBA*, XXVI, Abst. 3709.

3414 Evreinoff, V. A.
Contribution a l'étude des ancêtres des cerisiers de culture. **(Contribution to the study of the ancestors of cultivated cherries).**
J. Agric. trop. Bot. appl. 1956 : **3** : 415–21.
Notes on the geographical distribution and origin, morphological characteristics of the tree and fruit and suitability of the fruit for human consumption are presented for *Cerasus vulgaris*, *C. fruticosa*, *C. tomentosa*, *C. besseyii* and *C. avium* and the evolution of cultivated forms of cherry from these species is traced. *C. vulgaris* may have developed from a cross between *C. fruticosa* and *C. avium*.

3415 Kazjmin, G. T.
(*Prunus tomentosa*).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1957 : No. 1 : 38–40. [Russian].
Hardy, productive and large-fruited seedlings have been raised from *P. tomentosa* 'Rannjaja Rozovaja' [Early Pink] and 'Krasnaja Krupnaja' [Red Large] at Habarovsk. Habarovčanka, Amurka and several others have recently been made standards. Mention is also made of some hybrids between *P. tomentosa* and *P. besseyi* which come into bearing in the second year and are interesting for resistance to diseases. Some produce large fruits with a pleasant flavour.

3416 Smeets, L.
Some effects of the photoperiod on the shoot growth of cherry seedlings.
Euphytica, Wageningen 1956 : **5** : 238–44.
Differences have been observed between seedlings in respect of the date of termination of growth under photoperiods of 8, 16 or 24 hr.

3417 Lapins, K. & Hornby, C. A.
Leaf measurements as a means of identification of peach varieties in nursery trees.
Canad. J. agric. Sci. 1956 : **36** : 409–21.
Of the ten measurements made on leaf samples of five varieties, blade length, blade width, base angle, apex angle and petiole length were the most satisfactory as means of identification. None of these measurements could however be used to distinguish varieties which were closely similar in leaf characteristics. Large leaves from the middle portion of the central shoot provided the most reliable material for sampling.

3418 Baldini, E.
Osservazioni sulla resistenza al freddo delle cultivar di pesco nell'inverno 1956. **(Observations on the resistance to cold of cultivars of peaches in the winter of 1956).**
Riv. Ortoflorofruttic. ital. 1956 : **40** : 483–93.
Over 100 peach cultivars are listed in five groups according to the degree of damage caused to their dormant flower buds by the abnormally low temperatures experienced in north-central Italy during the winter of 1955–56.

3419 Oberle, G. D.
Breeding frost hardy peaches and nectarines for Virginia.
Virginia J. Sci. 1956 : **7** : 256–57. (Abst.).
Selections of peaches and nectarines with a high degree of frost resistance have been developed from crosses at the Virginia Agricultural Experiment Station.

3420 Noro, K. & Kajimoto, S.
(The effect of a Yuzu stock on the growth of the Unshu mandarin. I. On a triploid Yuzu plant).
Kagawa Nogyo Semmongakko Kenkyu Hokoku/Tech. Bull. Kagawa Agric. Coll. 1955 : **7** : 36–40. [Japanese].
A Yuzu stock carrying a markedly dwarfed scion of the Unshu mandarin in the prefecture of Tokushima was found to be a triploid ($2n = 27$).

3421 Gutiev, G.
(Subtropical fruit trees along the Black Sea Littoral).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 10 : 42–46. [Russian].
Among the results of breeding research at Soči are a hardy grapefruit Soči 3011 [Duncan grapefruit x Unshu (= Satsuma) mandarin] and a high-yielding fig selection Soči 15 which has large white fruits with a delicate flavour and a 60% sugar content.

3422 Caiyod, D. T. & Gonzales, L. G.
Outstanding varieties and forms of pummelo, *Citrus grandis* (Linn.) Osbeck, in some towns of Laguna.
Philipp. Agric. 1954 : **38** : 57–72.
Information is given on the orchard performance

and fruit characters of six varieties found in the Laguna province, Philippines.

3423 Hermoso, C. E. & Gonzalez, L. G.
Outstanding varieties and forms of pummelo, *Citrus grandis* (Linn.) Osbeck, in some towns of Batangas.
Philipp. Agric. 1954 : **38** : 225–42.
A report is given of the results of a study of the chemical properties and quality of 10 varieties and forms grown in the above province of the Philippines.

3424 Francia, F. R.
Outstanding varieties and forms of pummelo, *Citrus grandis* (Linn.) Osbeck, in some towns of Nueva Ecija.
Philipp. Agric. 1954 : **38** : 320–33.
The fruit characters, including chemical properties, of 10 varieties and forms found in the above province of the Philippines are surveyed.

3425 Veneroso, G.
Studio chimico-morfologico della foglia di alcune cultivar di *Morus alba* L. (**A chemical and morphological study of the leaves of some varieties of *M. alba* L.**).
Ann. Sper. agr. 1957 : **11** : 257–80.
The average size of the basal leaf angle and the percentages of water, dry matter, organic substances, mineral substances and crude fat present in the leaves of nine varieties of mulberry on four dates during the summer of 1954 have been calculated. The chemical composition of the leaves was found to differ on different dates both between and within varieties and cannot therefore be used as a criterion for the differentiation of varieties.

3426 Hotta, T.
Supplement to the knowledge of the systematics of *Morus* in Japan.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1951 : **64** : 223–26.
A short taxonomic review of wild Japanese mulberries is presented, including a description of the new species *M. miyabeana.*

3427 Hotta, T.
Taxonomical study on the wild mulberry in Japan and near countries (2).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1953 : **66** : 177–80.
A short synopsis of botanical varieties of *Morus australis* is presented.

3428 Gorbunov, M. G.
(**New species of *Juglans* from Tertiary deposits in western Siberia**).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 658–66. [Russian].
The three fossil species described combine characteristics of the present-day sections *Rhysocaryon* from North America and *Cardyocaryon* from Japan, and are thus thought to represent some prototype from which both these sections may have arisen.

3429 Šobek, J.
Výběr vhodných odrůd lísek. (**Selecting adapted hazel varieties**).
Sborn. čsl. Acad. zeměd. Věd: Řada rostlinná Výroba 1956 : **29** : 1083–92.
Trials of the principal varieties cultivated in Czechoslovakia are reported. Barrův, Cosford, Evženie and several others were notable for high yield and tolerance of low temperatures, pests and diseases and are regarded as best adapted to Czechoslovakian climatic and soil conditions.

3430 Sárai, V.
Az "Akali 60" mandulafajta. (**The almond variety Akali 60**).
Kertész. szőlész. Főiskol. Évkön. 1954 : **1** : 59–64.
The above variety, from the Balaton region in Hungary, gives higher yields both of entire fruits and of kernels per $m.^3$ of crown than the commonly grown variety Burbank, has sweet aromatic kernels containing 55·7% oil and is easily shelled either mechanically or by hand since the shell is brittle and not completely filled by the kernel. It is frost resistant but is moderately susceptible to *Sclerotinia.*

3431 Oram, P. A.
High-quality groundnuts for direct consumption - 1. Production, research and development in Libya.
World Crops 1957 : **9** : 159–62.
Details are given of the yield and quality of ten groundnut varieties, from the USA, the Sudan and West Africa, which have been under trial in Libya since their introduction by the FAO Mission in 1954.

3432 Bhavanishanker Rao, M. & Srinivasalu, N.
A new type in groundnut.
Curr. Sci. 1957 : **26** : 18–19.
A type with a rose-coloured incomplete testa has been developed from a putative natural hybrid between TMV1, a strain with a rose-

coloured complete testa, and var. *nambyquarae* with an incomplete purple-red testa at the Agricultural Research Station, Tindivanam, Madras State. Its seeds are large and low in oil content. The type may therefore be useful as a dessert variety; it is now undergoing yield trials.

3433 Hemingway, J. S.
The resistance of groundnuts to *Cercospora* leafspots.
Emp. J. exp. Agric. 1957 : **25** : No. 97 : 60–68.

In investigations at the Kongwa station of the Tanganyika Agricultural Corporation, varieties with light-green foliage were without exception susceptible or very susceptible to *C. personata* and *C. arachidicola*, while all those with darker foliage showed some degree of resistance. As revealed by study of the resistant varieties Kanyoma and Mwitunde and susceptible Natal Common, resistance depended upon a lower frequency of stomata of penetrable size in the upper epidermis of the leaf, the lower rate of growth of the lesions on resistant plants being associated with thicker palisade tissue.

3434 Liyanage, D. V.
Planting material for coconuts.
Ceylon Cocon. Quart. 1955 : **6** : 75–80.

The improvement of coconut planting material in Ceylon by means of mass selection, the establishment of seed gardens and the exploitation of hybrid vigour is discussed.

3435 Ledin, R. B.
The Barbados or West Indian cherry.
Sunshine St. agric. Res. Rep. 1956 : **1** : No. 4 : 4–5.

Some selections tested at the Subtropical Experiment Station, Florida, have given good yields of fruit with a high ascorbic acid content. A sweet selection has shown good cold tolerance and has given higher yields than the other selections tested.

3436 Nyékes, I.
A császlói som. (**The Cornelian cherry of Császló**).
Kertész. szőlész. Főiskol. Évkön. 1953 : **17** : 169–73.

A new form, *Cornus mas* f. *csaszloiensis*, is described which is similar to *C. mas* f. *macrocarpa* but differs in having larger fruits with more sharply pointed stones. It was found in a garden in Császló in the Szatmár region of Hungary.

3437 Howard, R. A.
Studies in the genus *Coccoloba*, III. The Jamaican species.
J. Arnold Arbor. 1957 : **38** : 81–106.

Taxonomic descriptions of ten species and one interspecific hybrid occurring in Jamaica are presented.

3438 Zinno, T.
(On the relation between the distribution of polyploidy in *Rubus* and light requirements).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1953 : **66** : 222–26. [Japanese].

An inverse relation was discovered between the degree of illumination in natural habitats in Ehime prefecture and the level of polyploidy in the series *R. parvifolius*, *R. wrightii*, *R. palmatoides*, *R. phoenicolasius*, *R. hirsutus*, all 2*x*; *R. sieboldii*, 4*x*; *R. pectinellus*, 6*x*; and *R. buergeri*, 8*x*.

3439 Geard, I. D.
Varietal susceptibility, control and seasonal incidence of raspberry leaf rust in Tasmania.
J. Aust. Inst. agric. Sci. 1956 : **22** : 285–88.

The raspberries Red Antwerp, Fillbasket, Taylor, Collins' Defiant and Norfolk Giant showed a high degree of resistance to *Phragmidium rubiidaei* at the Summerlea Horticultural Research Station, Tasmania.

3440 Bogdański, K., Zalewski, W. & Bogdańska, H.
Studium nad zawartością kwasu l-askorbinowego barwą i niektórymi innymi składnikami i cechami odmian czarnej porzeczki (*Ribes nigrum*). [**A study of the l-ascorbic acid content and certain other components and characteristics of varieties of black currant (*R. nigrum*)**].
Roczn. Nauk rol. Ser. A. : 1956 : **73** : 123–43.

Information provided on nine varieties includes data on the acidity, pectin content, epidermal thickness, cuticle thickness, size, weight, ascorbic acid content and colour intensity of the fruits and the force required to detach them.

3441 Johnston, S.
Blueberry breeding in Michigan.
Fruit Var. hort. Dig. 1956 : **11** : p. 20.

Crosses between lowbush blueberries from northern Michigan and highbush blueberries from south-western Michigan have yielded dwarf selections which show promise of being

suitable for growing in the northern part of the state and of equalling the best highbush varieties in berry size and colour. Selections with a maximum height of about 4 ft. may be useful in areas where highbush varieties may grow too tall for economical harvesting as the result of the severe pruning required. Varieties inheriting the drought resistance or shorter duration of the harvesting period characterizing the lowbush parents may also be useful in south-western Michigan.

3442 Žukovskaja, A. A.
(Trials of strawberry varieties).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 11 : 49–51. [Russian].

Among the varieties tested in the Leningrad province several varieties bred at Moscow, Leningrad and Pavlovsk were distinguished by hardiness, high yield, fair size and good flavour of the fruit.

3443 Sasaki, S., Maeda, T. & Sato, T.
(A summary of progress in breeding new strawberry strains for cold regions and the characteristics of the new forms).
Tohoku Nogyo Shikenjo Kenkyu Hokoku/Rep. Tohoku agric. Exp. Sta. 1955 : No. 4 : 129–32. [Japanese].

Four varieties have been bred for adaptability to northern Japan: Tohoku 1 [North-eastern 1] (Fairfax x Dorsett), Tohoku 2 (Dorsett x Ettersburg) and Tohoku 3 and 4 (Fairfax x Ettersburg).

3444 **New strawberry for western Washington.**
Fruit Var. hort. Dig. 1956 : **11** : p. 26.

The red-core resistant variety Puget Beauty (Sparkle x US–Ore. 1765) has been released by the State College of Washington. It is particularly sweet-flavoured and suitable for freezing.

3445 Erkamo, V.
Fragaria viridis Duch. ja *F. vesca* L. x *viridis* Duch. tavattu uudeltamaalta.
(The occurrence of *Fragaria viridis* Duch. and *F. vesca* L. x *F. viridis* Duch. in new territory).
Acta Soc. Fauna Flora fenn. 1955 : **72** : No. 4 : 1–7.

The above hybrid, hitherto principally known locally from the Åland islands, has now been discovered on the island of Takvedaholm near Helsinki.

3446 Szaák, M.
Szamóca fajtameghatározási kísérlet.
(Experiment on the determination of strawberry varieties).
Kertész. szőlész. Főiskol. Évkön. 1953 : **17** : 65–78.

On the basis of leaf, flower and fruit characters and performance in preliminary trials carried out in Hungary since 1951, 24 Hungarian and introduced varieties fell into three groups, typified by Mme. Moutot, Laxton's Noble and Huxley, respectively.

3447 McDaniel, J. C.
More on Howard 17 and (or) Premier strawberries.
Fruit Var. hort. Dig. 1956 : **11** : 30–31.

Some facts concerning the early history of Howard 17 and Premier are noted (cf. Abst. 883).

3448 Miller, P. W. & Waldo, G. F.
Relative resistance of some strawberry varieties and selections to powdery mildew at Corvallis, Oregon.
Plant Dis. Reptr. 1957 : **41** : 23–24.

The relative resistance of 44 strawberry varieties to infection by *Sphaerotheca macularis* under field conditions in at least one of the years 1954–56 is tabulated. A relatively high degree of field resistance at Corvallis, Oregon, was shown by Siletz, Sparkle, Indra, Puget Beauty and US–Ore. selections 2249, 2312, 2319, 2326 and 2328 (cf. *PBA*, XXV, Abst. 2372).

3449 Simmonds, N. W.
Botanical results of the banana collecting expedition, 1954-5.
Kew Bull. 1956 (1957) : 463–89.

The author reports the results of a taxonomic study of *Musa* spp. collected during the expedition which was organized by the Imperial College of Tropical Agriculture, Trinidad, BWI, to obtain material from south-east Asia and Queensland. Representatives of *M. acuminata* are assigned to various subspecies, each of which has a characteristic geographical distribution. Evidence of hybridity between subspecies was found, notably between sspp. *microcarpa* and *malaccensis* in Malaya. Collections of *M. acuminata* ssp. *banksii* (= *M. banksii*) are particularly important from the point of view of breeding. They all possess high ovule numbers, large fruits and large bunches. Other species of sect. *Musa* dealt with are *M. flaviflora* sp. nov., *M. balbisiana*, *M. itinerans*, *M. schizocarpa* sp. nov., *M. nagensium*, *M. sikkimensis*,

M. cheesmani sp. nov. and *Musa* sp. indet. Notes discussing *M. fitzalani* and *M. charlioi* are included. A revised statement of the geographical distribution of *M. balbisiana* is given. *M. schizocarpa* ($2n = 22$) is distinguished from all other members of the section by its peeling fruits. Descriptive notes and remarks are also provided for members of sects. *Rhodochlamys*, *Australimusa* and *Callimusa*. Of especial interest is the intersectional hybrid population of *M. flaviflora* x *M. velutina* found in Assam.

3450 Brewbaker, J. L. & Umali, D. L.
Classification of Philippine Musae I. The genera *Musa* L. and *Ensete* Horan.
Philipp. Agric. 1956 : **40** : 231–41.

Brewbaker, J. L., Gorrez, D. D. & Umali, D. L.
Classification of Philippine Musae II. Canton and Minay, putative hybrid forms of *Musa textilis* Née and *Musa balbisiana* Colla.
Ibid. 1956 : **40** : 242–57.

Brewbaker, J. L. & Gorrez, D. D.
Classification of Philippine Musae III. (A) Saguing maching (*Musa banksii* F.V.M.). (B) Alinsanay, a putative hybrid of *M. textilis* and *M. banksii*.
Ibid. 1956 : **40** : 258–68.

In the first of these articles the species and varieties of *Musa* and *Ensete* occurring in the Philippines are briefly described and a key for their identification is provided. In the second a morphological study of varieties of *M. textilis* and *M. balbisiana* and of two possible interspecific hybrids between them is reported and the mode of origin and value in breeding of the hybrids are discussed. The third article includes descriptions of *M. banksii* and a possible hybrid between this species and *M. textilis* and a discussion of the potential agronomic value of known and projected interspecific hybrids. Those between *M. textilis* and *M. balbisiana* are already known to possess resistance to abacá mosaic.

3451 Péterfi, Ş., Brugovitzky, E. & Molnár, E. L.
Cercetări morfologice şi biochimice la planta *Physalis alkekengi*. (**Morphological and biochemical investigations of the plant *Ph. alkekengi*).**
Stud. Cercet. şti., Cluj : Ser. 2 : 1955– **6** : No. 3–4 : 43–56.

The above plant has a high vitamin C content (102·2–171·3 mg. %) and a higher sugar content than tomatoes. F_2 hybrids between the tomato and *Ph. alkekengi* are intermediate in vitamin C and sugar contents between the parental species; in addition the thick-walled pericarp reduces the chances of mechanical damage to the fruits.

3452 Bruni, B.
La varietà Cardinale e le uve da tavola in Italia. (**The variety Cardinal and dessert grapes in Italy**).
G. Agric. 1956 : **66** : p. 457.

Some defects of the Cardinal grape when grown in central or northern Italy (cf. Abst. 893) are mentioned and it is pointed out that the varieties Ribier and Alphonse Lavallée given as one of its parents (cf. *PBA*, XXII, Abst. 1441) are not synonymous.

3453 Breider, H.
Über strahleninduzierte somatische Mutationen bei Reben. (**On somatic mutations in the grape induced by irradiation**).
Bayer. landw. Jb. 1956 : **33** : 515–33.

The effects of different kinds of irradiation, including X, α, β and γ rays, upon the living cell are discussed in general terms with reference to the induction of somatic mutations in the grape (cf. *PBA*, XXIV, Absts. 646–7). Mutations in the pigmentation of the leaf are independent of those in the pigmentation of the fruit. Mutant leaves or bunches alternated with nonmutants on the same stem; a number of variations of this pattern were observed. Numerous chlorophyll mutants were caused by irradation, including sectorial mutants and variegation of the leaves. A mutant of Silvaner obtained by irradiating dormant buds with 750 r. was noteworthy for its high yields. Differences between varieties in reaction to irradiation were observed (cf. Abst. 2233). The author concludes that irradiation to induce somatic mutations merits investigation as a possible means of developing new improved varieties.

3454 Katarjjan, T. G.
(**Magarač**).
Nauk. pered. Opyt seljsk. Hozjaĭstv. (Sci. progr. Exp. Agric.) 1957 : No. 2 : 31–34. [Russian].

Mention is made of new varieties of vines bred at the Magarač Viticultural Institute and its branch stations. They include dessert and wine varieties and varieties grown for their dried product. Most of these outyield the older

standards and surpass them in quality. Magarač 217, now grown in the Crimea and in central Asia, yields 100–110 c. per ha. or twice as much as its high-yielding parent Saperavi and nearly three times as much as Bastardo, the other parent. Some hardy new varieties from central Asia are tolerant of −30° C.

3455 Schad, C. & Dupoux, A.
Résultats de l'expérimentation sur les hybrides producteurs de vigne pour la période de 1946 à 1953. (**Results of experiments on vine hybrid producers for the period from 1946 to 1953**).
Ann. Inst. nat. Rech. agron., Paris : Sér. B : 1956 : **6** : 239–79.

Work on the production of hybrid grapes at the Cours-lès-Cosne Experimental Station, France, is described and data on the comparative yields, resistance to frost and quality of the wine produced are presented for a wide range of varieties developed there. Of those hybrids producing white wine, Ravat 6, SV5276 and SV15151 have given the best results and of hybrids producing red wine, SV18283, SV18315, S8365 and S8745 have proved superior.

3456 Soldatov, P. K.
(**Clonal selection of vines**).
Vinodelie Vinogradarstvo SSR (Winemak. & Vitic. USSR) 1956 : No. 7 : 42–49. [Russian].

Mention is made of two bud mutations of Kišmiš Černyĭ [Black Sultana], recently selected in Uzbekistan. They produce larger grapes than the original variety and differ from this morphologically. One of them has bunches double the usual size.

3457 Bruni, B.
"Torbato".
Ann. Sper. agr. 1957 : **11** : No. 1 : Suppl. : lxxxv–xci.

This Spanish grape variety, which is described, is grown in the province of Sassari for the production of a high-quality wine.

3458 Del Gaudio, S. & Giusto, D.
"Ottavianello."
Ann. Sper. agr. 1957 : **11** : No. 1 : Suppl. : xciii–xcix.

This purple grape variety, only used for wine making, is described.

3459 Bruni, B.
"Monica."
Ann. Sper. agr. 1957 : **11** : No. 1 : Suppl. : ci–cviii.

It is suggested that this grape variety, which is described, may have been brought from Spain to Sardinia by the Moors. It gives good yields of black or deep-purple grapes which are used for making a high-quality red wine.

3460 Mihaĭlova, P. V.
(**Variation in flower type in vines**).
Bot. Ž. (Bot. J.), Moskva 1956 : **41** : 542–49. [Russian].

Several hybrids of *Vitis vinifera* with *V. amurensis* and *V. rupestris* bore only male flowers in the first year and a gynecium appeared only in later years, after varying intervals according to the seedling. As soon as any seedling began forming ovaries a certain number of berries developed too. From these observations it is concluded that the hermaphrodite flower in vines has evolved from a male flower.

3461 Vasiljeva, Z. V.
(**Photosynthesis of some vine varieties under the conditions of the province of Moscow**).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1956 : No. 24 : 51–58. [Russian].

The early-ripening variety Alpha had a higher rate of assimilation than the late varieties Buĭtur and Korinka Mičurina [Mičurin's Currant]. *Vitis amurensis* showed the highest rate of all in the early period of development but the lowest in the second half.

3462 Kozma, P.
A kadarka szőlőfajta virágtípusai, a virágtípusok változékonysága és termékenysége. (**Floral types in the grape variety Kadarka and their variability and fertility**).
Kertész. szőlész. Főiskol. Évkön. 1956 : **2** : 31–111.

Kozma, P.
Étude sur la variabilité et la fécondité des types floraux du cépage de Kadarka. (**Study of the variability and fertility of the floral types of the grape variety Kadarka**).
Acta agron. Budapest 1956 : **5** : 301–91.

Observations on variation in flower structure, in the proportions of female, male and hermaphrodite flowers on different parts of the vine and in different strains and in fertility and yield in the variety Kadarka are reported in detail and the possibility of selection for improved fertility and yield is discussed.

3463 Garber, E. D. & Goldman, M.
The response of grape tissue cultures to inoculation with biochemical mutants of *Erwinia aroideae*.
Bot. Gaz. 1956 : **118** : 128–30.
Intact or macerated tissue cultures of *Vitis vinifera* were inoculated with mutants of *E. aroideae* requiring specific aminoacids. Intact cultures reacted less rapidly than macerated and the mutants differed in rate of attack. It is suggested that these results are a reflection of differences in the concentration of the required nutritional substances at the site of inoculation.

3464 Santilli, V.
A physiologic form of *Plasmopara viticola* found for the first time.
Phytopathology 1957 : **47** : p. 30. (Abst.).
Inoculation of leaves of *Vitis californica* with an isolate of *P. viticola* from the eastern United States gave a more severe infection than similar inoculations using an isolate from California, the differences in virulence being more marked on older leaves.

FOREST TREES

3465 Edwards, M. V.
The design, layout and control of provenance experiments.
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 169–80.
The layouts used for provenance trials of forest trees by the Forestry Commission in Scotland are described. Special attention is given to plot size and shape, edge effect, type of design, spacing, beating up and thinning. On rough terrain, randomized blocks are the preferred design.

3466 Langner, W.
Ernst Münch 26.11.1876-9.10.1946.
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 137–39.
An account of the life and career of E. Münch, the forest-tree geneticist, is presented, together with a complete bibliography of his published works.

3467 Gathy P.
Recherches belges sur la variabilité génétique des espèces forestières. (**Belgian studies on the genetical variability of forest tree species**).
Silv. genet. 1957 : **6** : 32–38.
Work being carried out in Belgium on studying the comparative suitability for Belgian conditions of provenance types of *P. sylvestris*, *P. laricio*, *P. nigra*, *Picea abies*, *Pseudotsuga taxifolia*, *Larix europaea*, *L. leptolepis*, *Quercus* spp. and *Fagus* spp. from different parts of the world is outlined.

3468 Rossmässler, W.
Das Forstliche Artgesetz als Grundlage und Ausgangspunkt der Forstpflanzenzüchtung. (**The German seed law as a basis and starting point for forest tree breeding**).
Silv. genet. 1957 : **6** : 54–57.
The selection of local races, plus trees from stands of such races and individual trees for progeny testing is discussed with reference to existing legislation in Germany concerning the control of forest-tree seed (cf. *PBA*, XXVI, Abst. 3801).

3469 Silliman, F. E.
A study of a colony of hybrid oaks.
J. Elisha Mitchell sci. Soc. 1956 : **72** : 193–94. (Abst.).
A study of a population involving combinations between *Quercus alba* and *Q. prinus* was analysed by Anderson's hybrid index method. About 3% of the population consisted of F_1 hybrids and about 37% of F_2 segregates and back crosses to *Q. prinus*.

3470 Krahl-Urban, J.
Über Eichen-Provenienzversuche. (**On oak provenance trials**).
Silv. genet. 1957 : **6** : 15–31.
The literature on oak provenance trials is reviewed with reference to the author's own experiments at Syke, near Bremen, Grafrath, near Munich, the Bramwald Forest, near Münden, and Bogesund, near Stockholm, in which provenance types of *Quercus robur* and *Q. petraea* from Denmark, Sweden, Germany, Austria, England and France were compared. Considerable differences were observed in respect of time of flushing and defoliation, resistance to frost and mildew and growth habit. Provenance types from Sweden tended to shed their leaves earlier than those from warmer countries such as England and France.

3471 **Genetics and selection.**
FAO UN, Rome 1956 : No. FAO/CIP/LAPC/7 : Pp. 8. (Mimeographed).
This memorandum provides a general outline of methods of improving *Populus* spp. Most attention is given to selection but the possibilities of hybridization, polyploidization and radiation-induced mutation are also indicated.

3472 Kopecky, F.
Problems of breeding black poplar in Hungary.
Acta agron., Budapest 1956 : **6** : 307–20.

Kopecky, F.
Feketenyárnemesítésünk kérdései.
(Problems of breeding our black poplars).
Erdész. Kutat. 1956 : **1** : 17–32.

Crosses effected in 1952–55 at the Sárvár Institute of Science, Hungary, among clones of *Populus nigra, P. nigra* var. *thevestina, P. nigra* var. *italica, P. nigra* var. *serotina* and *P. angulata* have given rise to individuals of desirable form exceeding both parents in rate of growth. The progenies of interspecific crosss between the above varieties and species on the one hand and *P. alba, P. bolleana* and *P. tremula* on the other were mostly dwarfed and weak but a few good seedlings resembling the maternal parent have been obtained from *P. canescens* ♀ x *P. nigra* ♂. The chief aim of breeding is the production of short-day varieties suited to Hungarian conditions to replace long-day poplars imported from Western Europe.

3473 Johnsson, H.
Heterosiserscheinungen bei Hybriden zwischen Breitengradrassen von *Populus tremula*. **(Heterosis manifestations in hybrids between latitudinal races of *P. tremula*).**
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 156–60.

When grown in southerly latitudes in Sweden, provenance types from the north show a decrease in growth rate (cf. *PBA*, XXV, Abst. 3451). However, five of six hybrid families obtained from crosses between northern and southern provenance types displayed pronounced heterosis when grown in the south, in some cases growing more more rapidly than the indigenous type. It is therefore suggested that, by constructing seed orchards consisting of parent trees of different provenance, it should prove possible to produce seed that can be planted over a more extensive area than has proved possible hitherto, the negative effect caused by change in locality being neutralized by the effects of heterosis.

3474 Eifler, I.
Artkreuzungen bei Birken. **(Interspecific crosses in birches).**
Züchter 1956 : **26** : 342–46.

Crosses of *Betula verrucosa* ♀ ($2n = 28$) with *B. pubescens* ($2n = 56$) and *B. urticifolia* ($2n = 56$) gave rise to triploid progenies possessing morphological characteristics derived, in each case, from both parent species. The hybrids evinced pronounced heterotic effects in the juvenile stage.

3475 Scholz, E.
Röntgenmutationen bei der Birke. **(X-ray mutations in birch).**
Züchter 1957 : **27** : 54–60.

At the Eberswalde Forestry Institute, Eastern Germany, X irradiation of dormant seeds of *Betula pubescens* and *B. verrucosa* gave rise to three kinds of mutation, (1) trees with forked branches, (2) trees with light-yellow patches on the leaves and (3) trees with dark-green patches on the leaves. All the mutants proved sterile. The possibility of obtaining economically valuable mutants of forest trees by irradiation or treatment with chemicals is discussed in general terms.

3476 Ljubavskaja, A. Ja.
(Special points concerning breeding and seed growing of the Karelian birch).
Lez. Hoz. (Forestry) 1956 : No. 12 : 35–42. [Russian].

Forms from the Karelian ASSR, distinguished by habit, bark colour, leaf and seed shape, boss formation along the trunk and different grain patterns are described. The highest percentages of seedlings were raised from seed obtained from adult trees by open pollination or by fertilization with pollen from the Karelian birch or the common form of *Betula verrucosa*. It is thought however that the latter impairs the heritable properties of the Karelian birch.

3477 Grudzinskaja, I. A.
(The importance of the Ulmaceae to afforestation in the steppe).
Trud. Inst. Lesa (Trans. Inst. For.) 1956 : **30** : 220–34. [Russian].

Ulmus campestris proved the most drought-resistant species at the Derkul Research Station of the Forestry Institute and *U. pumila* var. *arborea* was characterized by rapid growth and was more adapted to arid steppe conditions than *U. laevis*.

3478 Lăzărescu, C.
Contribution to the method of obtaining and breeding ash-tree hybrids.
Rev. Biol., București 1956 : **1** : 117–26.

Interspecific hybrids have been reared by crossing *Fraxinus pennsylvanica* and *F. lanceolata*, on the one hand, with steppe and hygrophilous races of *F. excelsior*, on the other. The hybrids

have been grafted with *F. excelsior* as a mentor in the hope of improving their timber quality and growth habit.

3479 Domokos, J.
A virágos kőris (*Fraxinus ornus* L.) változékonysága. (**The variability of *F. ornus* L.**).
Kertész. szőlész. Főiskol. Évkön. 1953 : **17** : 187–92.

Preliminary studies of the variability of the above species around Budapest and Lake Balaton have led to the identification of several varieties, based on differences in position, form and colour of the inflorescence and in shape and colour of the fruits and leaves. The material is being multiplied vegetatively with the ultimate aim of selecting drought-resistant forms.

3480 Shibata, K., Ogoshi, Y. & Nakata, G.
(**Cytological studies on Coniferous plants. I. Chromosome numbers of several species of *Chamaecyparis*, *Cryptomeria* and *Pinus***).
Senshokutai (Chromosome)/Kromosomo 1956 : No. 29 : 1025–28. [Japanese].

Chromosome counts and illustrations of mitotic figures are provided for 13 representatives of the above genera.

3481 Toyama, S.
(**Information on forest-tree breeding. Forest-tree breeding and fundamental studies on it. XXIV**).
Ringyo Shikenjo Kenkyu Hokoku/Bull. Govt. For. Exp. Sta. 1953–54 : No. 65 : Pp. 269. [Japanese].

The principal matters dealt with in this report are: (1) racial differentiation in *Cryptomeria japonica*, (2) the élite selection, No. 26, of *Pinus thunbergii*, which is characterized by rapid growth and resistance to drought and cold; (3) some X-ray-induced mutants of *C. japonica* and (4) colchicine-induced tetraploids of *P. thunbergii*.

3482 Poulsen, G.
Fransk bjergfyr. (***Pinus uncinata***).
Hedeselsk. Tidsskr., Aarhus 1957 : **78** : 87–96.

P. uncinata types found in the French Alps and the Pyrenees are described and an account is given of natural hybrids between *P. uncinata* and *P. sylvestris*, occurring in the Vallée du Marcadeau. It is thought that types suitable for Denmark combining the hardiness of *P. uncinata* with the growth characteristic of *P. sylvestris* may be obtained either from the natural hybrids, which are highly variable, or by artificial hybridization.

3483 McMillan, C.
The edaphic restriction of *Cupressus* and *Pinus* in the coast ranges of central California.
Ecol. Monogr. 1956 : **26** : 177–212.

Interspecific and intraspecific differences in *Pinus* and *Cupressus* with respect to adaptability to serpentine and other soils are described.

3484 Röhrig, E.
Über die Schwarzkiefer (*Pinus nigra* Arnold) und ihre Formen. I. Teil: Die natürlichen Standorte. [**On the black pine (*P. nigra* Arnold) and its forms. Part I. Natural stands**].
Silv. genet. 1957 : **6** : 39–53.

The morphological and physiological characteristics of *P. nigra* found in the Iberian peninsula, Corsica, Italy, the Balkans, Cyprus and Turkey are compared. Provenance types from Corsica, central Yugoslavia and Turkey possess good growth habits and very straight trunks. Provenance trials of *P. nigra* are now being initiated in western Germany.

3485 Wright, J. W. & Baldwin, H. I.
The 1938 International Union Scotch pine provenance test in New Hampshire.
Silv. genet. 1957 : **6** : 2–14.

The growth rate, bole form and growth habit of trees grown in Hillsboro, NH, USA, from seeds obtained in 1938 from the Baltic States, Scandinavia, Central Europe, Belgium and Scotland were compared. The Belgian ecotype grew the fastest, followed by the Central European ecotype; both these types, however, proved undesirable from the point of view of bole form and shape of the main stem and branches. The ecotype from the Baltic States, which grows moderately quickly and has a satisfactory bole form, appears to be the most satisfactory for New Hampshire conditions.

3486 Stoeckeler, J. H. & Rudolf, P. O.
Winter coloration and growth of Jack pine in the nursery as affected by seed source.
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 161–65.

Juvenile trees of *Pinus banksiana* grown at the Rhinelander nursery site, Wis., of the Lake States Forest Experiment Station were found to vary in growth rate and extent of reddish colouring of needles in winter according to the locality from which the seed had been obtained. Studies of the 29 provenance types concerned showed that northern ecotypes had a more pronounced reddish pigmentation of the leaves in

winter than the southern ecotypes and that their rate of growth was slower. The amount of reddish pigment in the leaves did not appear to be closely associated with resistance to low temperatures but it provides a useful criterion in distinguishing between different provenance types in the juvenile stage.

3487 Dillon, E. S. & Zobel, B. J.
A simple test for viability of pine pollen.
J. For. 1957 : **55** : 31–32.

A method developed by the Texas Forest Service involves suspending the pollen in distilled water or sucrose solution in a screw-topped vial for 72 hr. at about 75°–80° F., with frequent shaking. Percentage germination is then determined microscopically. Distilled water generally gives a higher percentage germination than 3, 5 or 10% sucrose solution.

3488 Bolland, G.
Resistenzuntersuchungen vor allem über Kienzopf und Schütte an der Kiefer. (**Resistance studies in pine, especially on *Peridermium pini* and *Lophodermium pinastri***).
Züchter 1957 : **27** : 38–47.

The results are presented of studies at the Waldsieversdorf Forest-tree Breeding Station, Eastern Germany, on the conditions under which natural infection of pine with fungous and other diseases occurs, on the mode of infection and on how diseased trees may be recognized. Resistance to both *P. pini* and *L. pinastri* appears to be determined by several genes and breeding for resistance is complicated by the fact that several physiological races of both pathogens occur. Élite trees with resistance to both *P. pini* and *L. pinastri* have been selected.

3489 Schrötter, F. W. von
Zur Frage der Fichtenauslese und -züchtung in Schleswig-Holstein. (**On the question of the selection and breeding of spruce in Schleswig-Holstein**).
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 186–94.

Spruce is not indigenous to Schleswig-Holstein and the introduction of different provenance types from the rest of Germany and from Scandinavia in past centuries has resulted in a gradual intermingling of, and hybridization between, the different forms to such an extent that the original provenance types are no longer recognizable. Recent studies carried out by the Schleswig-Holstein Forestry Commission have shown that two main types, neither of which appears to be identifiable with forms described by forestry workers elsewhere, can be distinguished, viz. a so-called banner type, characterized by unforked terminal shoots with secondary shoots hanging down to give the impression of a frayed banner, and a wing type, in which the main axis of the branch is forked. These types grow in separate ecological areas, with pure forms in the centre of each area and intermediate forms around the fringes. The wing type is characterized by a high degree of resistance to shade and has finer branches and a straighter stem than the banner type. Tests are being carried out to determine the comparative rates of growth and timber properties of the two forms and the selection of plus trees is being undertaken.

3490 Kiellander, C. L.
Über eine spättreibende Rasse von *Picea abies* in Schweden und eine Schwierigkeit bei der Plusbaumauswahl. (**On a late-flushing race of *P. abies* in Sweden and a difficulty in the selection of plus trees**).
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 181–85.

Late-flushing individuals found in a stand of *P. abies* in Skåne, southern Sweden, are described; they are of potential value in breeding work because they avoid early spring frosts. A selected plus tree of this type, when artificially pollinated with pollen from trees that did not possess the late-flushing habit, transmitted this characteristic to the F_1 but failed to pass on any other of its desirable properties. Studies of other plus trees of *P. abies* and their progenies led to the conclusion that many trees selected for breeding purposes by reason of their rate of growth and size were, in fact, not genetically superior but had enjoyed the advantage of growing under more favourable environmental conditions. Growth rate and final size of the tree in *P. abies* would appear to be extremely susceptible to environmental conditions such as type of soil and degree of competition with trees of the same or other species, so that extreme care is necessary in the selection of genuine plus trees for breeding purposes.

3491 van Vloten, H.
De schotse hybride van Japanse lariks in Nederland. (**The Scottish hybrid of Japanese larch in the Netherlands**).
Ned. BoschbTijdschr. 1954 : **26** : 340–43.

A 24-year old stand of *Larix leptolepis* x *L. europaea* from seed obtained from Dunkeld, Scotland, and sown in Drente, Netherlands, had 76% greater volume than a comparable stand of

Japanese larch and was free from canker, *Dasyscypha willkommii*. Canker occurred in the F_2 hybrids obtained by open pollination.

3492 Morris, W. G., Silen, R. R. & Irgens-Moller, H.
Consistency of bud bursting in Douglas-fir.
J. For. 1957 : **55** : 208–10.

Observations made in various years since 1933 on plantations of trees derived from 120 parent trees from 13 sources in Oregon and Washington showed that the order in which the different provenance types flushed varied little with plantation locality or year, the latest trees generally being those originating from areas subject to warm spring days and cold nights. These and other results suggest that time of flushing is genetically controlled and that it may be possible to select for late flushing, a character which affords protection against late spring frosts and appears to have no adverse effect upon annual growth.

3493 Orr-Ewing, A. L.
Controlled pollination techniques for the Douglas fir.
For. Sci. 1956 : **2** : 251–57.

In work on *Pseudotsuga menziesii* in British Columbia, ♀ cone buds were isolated by means of bags made of viscose sausage casing. Pollen was collected from twigs brought indoors and stored at 4° C. in lightly stoppered flasks in an ordinary refrigerator. A technique of testing pollen viability is described. The results of germination tests showed that the pollen lost its viability fairly rapidly when stored as described. Data from such tests were not a reliable indication of fertilizing ability.

3494 Rohmeder, E.
Professor Münchs Anbauversuch mit Douglasien verschiedener Herkunft und anderen Nadelbaumarten im Forstamt Kaiserslautern-Ost 1912 bis 1954.
(**Professor Münch's plantation trial of Douglas firs of different provenance and of other coniferous species in the Kaiserslautern-Ost forestry district from 1912 to 1954**).
Z. Forstgen. Forstpflanzenz. 1956 : **5** : 142–56.

The relative performances of different provenance types of *Pseudotsuga douglasii* planted in the Kaiserslautern-Ost forestry district in 1912 were compared. The form *viridis* from Snoqualmie, Wash., USA, was found to have a considerably faster rate of growth, to produce up to twice as much timber and to be considerably more resistant to *Rhabdocline pseudotsugae* and *Phaeocryptopus gaeumannii* than nine other provenance types from North America. Of the other coniferous species grown as controls, *Pinus strobus* gave the best results but was still considerably inferior in timber yield and disease resistance to the Snoqualmie provenance type of Douglas fir.

VEGETABLES

3495 Hahn, P. & Mildner, E.
Neue Gemüsesorten, die 1956 in die Sortenliste aufgenommen und für den Anbau zugelassen wurden. (**New vegetable varieties that have been entered in the 1956 variety list and approved for cultivation**).
Dtsch. Gartenbau 1956 : **3** : 231–34.

The following new vegetable varieties approved for cultivation in East Germany are described.
Kohl rabi. Knaufs Frühweiss [Knauf's Early White] is an early-maturing variety that grows vigorously and produces large, round globes. Erfordia is distinguished by its compact foliage and good resistance to bolting, and is suitable for forcing under glass.
Radish. Developed at the Quedlinburg Plant Breeding Institute, Primus is an early-maturing variety suitable for forcing. It produces large, round, firm roots of a bright red colour and is resistant to sponginess.
Brussels sprouts. Meteor is an early, highly productive variety with a short stalk, dense foliage and a good degree of resistance to frost. The sprouts are oval in shape, firm and of an attractive appearance.
Lettuce. Delikata, from the Quedlinburg Plant Breeding Institute, is a late outdoor variety moderately resistant to diseases and bolting. It produces large heads and large, dark-green leaves with light-brown patches. As the leaves are very tender, this variety does not transport well.
Gherkin. Dickfleischige Gelbe [Thick-fleshed Yellow] is a hardy, outdoor variety producing high yields of yellow fruits suitable for preserving.
Beans. Nobila is a productive, medium-early dwarf bean with large, green leaves and produces long, narrow pods with white to ivory seeds. The dwarf bean Goldmarie gives good yields of long fleshy pods and possesses the advantage of being moderately resistant to *Colletotrichum lindemuthianum*. The climbing bean Meisterwerk II [Masterpiece II] possesses the same qualities as Meisterwerk but produces considerably higher yields.

Peas. Insignis is a productive, medium-early marrowfat with a bushy growth habit. Trumpf [Trump], a midlate garden pea with greenish-yellow seeds, outyields most other varieties of dwarf garden peas. Ambrosia and Dickmadam are highly-productive sugar peas.

3496 Philipp, F.
Ergebnisse der Sommer- und Spätgemüsesortenversuche 1955 II. (Im Rahmen der österreichischen Zuchtbuchkommission). [**Results of trials of summer and late vegetable varieties in 1955, II. (In connexion with the commission for the Austrian book of cultivated varieties)**].
Mitt. Klosterneuburg : Ser. B : 1956 : **6** : 311–32.

Tabulated data are presented on new and established varieties of cucumber, green pepper, tomato, dwarf and climbing French beans and parsley tested at the Federal Agricultural Station, Schönbrunn, and at other centres in Austria in 1955 (cf. *PBA*, XXVI, Abst. 3841).

3497 Nóber, I.
Nemesítés és vetmőagtermesztés Újmajorban. (**Breeding and seed production at Újmajor**).
Agrártudomány 1955 : **7** : 237–41.

The following new varieties have been developed at the Újmajor experimental farm, Hungary, during 1950–55.

Capsicum. By means of selection in a local variety accompanied by intervarietal crossing, the drought-resistant, nonpungent sweet pepper Újmajori sárga [Újmajor Yellow] has been produced.

Melon. A new musk melon selection, Javított kincs [Improved Treasure], surpasses other varieties in its earliness, uniformity and consistently high yields. An attempt is being made to eliminate its smooth-skinned character and its pale flesh colour by intervarietal crossing. The new water melon Újmajori görögdinnye [Újmajor water melon] contains 11% dry matter, has small seeds, is bright red in colour and has a thin rind.

Cucumber. A constantly high-yielding drought-resistant form has been developed. The aim of selection was to obtain forms with main shoots equal to or shorter than the average and with at least 4–6 secondary branches and 3–4 tertiary branches.

Tomato. The new variety Bíbor [Scarlet], with improved dry matter content, has been developed from Scarlet Down.

Pea. A promising new hybrid has been produced between Petit Provençal [Provençal Small] and Konservkönigin [Canning Queen].

3498 Ušakova, E. I.
(**Breeding methods and growing élite seed of horticultural plants**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 10 : 6–11. [Russian].

This report dealing with Mičurinist breeding techniques mentions new varieties of horticultural crops from Gribovo, among them a carrot notable for good keeping properties, a drought resistant cabbage, early hardy tomatoes and uniformly ripening peas.

3499 Andronicescu, D.
Date preliminare asupra comportării soiurilor de legume în Dobrogea de mijloc. (**Preliminary data on the behaviour of vegetable varieties in central Dobrogea**).
Anal. Inst. Cerc. agron. Român. 1954–1955 (1956) : **23** : No. 4 : 297–306.

Varietal trials of *Capsicum*, cabbage, tomato, egg plant, French beans and peas are reported.

3500 Luh [Lu], C.-L.
Vegetable production in Taiwan and its problems.
Pl. Indust. Ser. Chin.-Amer. Joint Comm. rur. Reconstr., Taiwan 1956 : No. 6 : Pp. 32.

Information is provided on the performance of 43 introduced varieties of 15 vegetable species introduced recently into Taiwan.

3501 Pasjko, I. Ja. & Maklakov, V. P.
(**For conserving local varieties of horticultural crops including cucurbits**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 10 : 13–15. [Russian].

Descriptions of some older varieties from the Poltava province, which are said to have been superseded by inferior new material, are given. These include the cabbage Zavorskljanka, which outyields Braunschweig and shows resistance to splitting, a melon notable for productiveness and earliness and large-fruited water melons distinguished by fine quality, good transportability and high yield.

3502 Svensson, V.
Morot Regulus II W : s/54 Original. (**The carrot Regulus II W : s/54 Original**).
Weibulls ill. Årsb. 1957 : **52** : 33–36.

Although slightly lower-yielding than the parent variety Regulus I, the new selection Regulus II produces a higher proportion of deeply coloured

roots, reaches maturity earlier and has a higher content of β-carotene.

3503 KUMAKI, Y.
(Studies on the vernalization of carrots).
Engeigaku Kai Zasshi/J. hort. Ass. Japan 1956 : **25** : 163–66. [Japanese].

Varietal differences in the effect of vernalization on the date of differentiation of flower buds and on bolting are noted.

3504 TATEBE, T.
(Studies on the genetics of self and cross incompatibility in the oriental radish II).
Engeigaku Kai Zasshi/J. hort. Ass. Japan 1956 : **25** : 157–62. [Japanese].

Genetical studies on the determination of compatibility in the varieties Tokinashi and Nerima are reported. Two multiple allelomorphic series determining incompatibility, *S* and *I*, are postulated. *S* genes are believed to be epistatic to *I* genes except when the *S* genes are heterozygous.

3505 KRICKL, M.
Zur Frage der Züchtung nicht pelzig werdender Radieschen. **(On the question of breeding radishes that do not become spongy).**
Saatgutwirtschaft 1957 : **9** : 35–38.

Tabulated data are presented on varietal differences in the tendency to become spongy and the effects of external environmental conditions, including type of soil, day length and climatic conditions, on the occurrence of sponginess in the radish are discussed. Selection at the Schönbrunn Horticultural Research Station, Vienna, has resulted in lines suitable for forcing and with a reduced tendency towards sponginess. (Cf. Abst. 2334).

3506 BACHMANOWA, S. & TABIN, S.
Ocena przydatności 15 klonów róznych odmian bulwy (*Helianthus tuberosus* L.) dla przemysłu gorzelniczego. **[An evaluation of the suitability of 15 clones of different varieties of artichoke (*H. tuberosus*) for the distilling industry].**
Ann. Univ. M. Curie-Skłodowska 1956 : **10** : 301–21.

In trials carried out at the Puławy Institute of Plant Breeding and Acclimatization, Poland, white varieties were superior to red and yellow types, the highest yields of tubers and of alcohol per ha. being given by the following varieties: 4 and 6 from Wrocław; 14, from Osiny; and 11, from Lublin. No significant correlation was observed between content of reducing sugars in the tubers and yield of alcohol.

3507 PEREGUDT, M. F.
(Intervarietal hybridization of the onion).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 10 : 16–18. [Russian].

This report on restricted intervarietal open pollination gives percentages of hybrid bulbs obtained from different sets of components at Simferopolj and also data showing improved size of the bulbs and increased yield of the F_1 and F_2 for a number of hybrids involving the local variety Čebotarskiĭ as the seed parent. Čebotarskiĭ x Johnson, Čebotarskiĭ x Ispanskiĭ [Spanish] and Čebotarskiĭ x Express were among the most productive hybrids. The keeping properties of Jalta and Johnson were improved by pollinating the former with Johnson and the latter with Express or Čebotarskiĭ.

3508 KATO, Y.
(On the natural course of mitosis in *Allium fistulosum*).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1951 : **64** : 152–56. [Japanese].

Various spontaneously occurring aberrations, in particular chromosome breaks, noted in root-tip mitoses are described.

3509 KATO, Y.
Descriptive and experimental cytology in *Allium* II. Chromosome breakage in the seedling of *Allium*.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1954 : **67** : 122–28.

Chromosome breaks are found during the early stages of germination of *A. fistulosum* in the root tip. They are more frequent in seedlings from old than from fresh seeds; in the later stages of development, mitosis is regular. In *A. odorum*, mitotic aberrations also occur in the early stages of germination but not in the later.

Aqueous extracts from *A. fistulosum* seeds cause mitotic aberrations in root tips of the same species. Aqueous extracts of fresh soya-bean testas inhibited mitosis in *A. fistulosum*, while extracts of fresh soya-bean embryos gave rise to some tetraploid divisions. Extracts from aged soya-bean embryos induced chromosome breakage in *A. fistulosum* (cf. *PBA*, XXIV, Abst. 690).

3510 HELM, J.
Die zu Würz- und Speisezwecken kultivierten Arten der Gattung *Allium* L. **(On species of the genus *Allium* grown for seasoning or eating).**
Kulturpflanze, Berlin 1956 : No. **4** : 130–80.

A history of the cultivation of the genus *Allium* is given and views that have been put forward

by various authors on the geographical origin of the different species and their later distribution are discussed. The morphological characteristics of each species and its botanical varieties are outlined in some detail and a key is provided to the more important species grown in Europe and Asia.

3511 Modilevskiĭ, Ja. S.
(The question of amitotic methods of cell division in *Allium odorum*).
Bot. Ž. (Bot. J.), Kiïv 1955 : **12** : No. 4 : 13–24. [Ukrainian].

Cytological processes in the ovules of *A. odorum*, from the beginning of macrosporogenesis till seed maturation, are described. It was found that at all phases of development the nuclei multiplied by simple division. This confirms the previous observations of Haberlandt and the author and conflicts with the observations reported by Èllengorn *et al.* (cf. *PBA*, XXV, Abst. 2711). The results reported by the latter writers are attributed to faulty technique.

3512 Hepler, P. R.
Inheritance of resistance to *Puccinia asparagi* DC. in *Asparagus officinalis* L.
Diss. Abstr. 1956 : **16** : Publ. No. 16,400 : p. 849.

The following varieties exhibited resistance to *P. asparagi* in tests on seedlings and three-months old plants: Mary Washington, Martha Washington, Waltham Washington, Seneca Washington, Argenteuil, Palmetto, Paradise, California 500, Viking and Raritan. Resistant and highly susceptible hybrid populations differed by a minimum of four or five genes, at least one of the genes for susceptibility being linked with a dominant gene inhibiting anthocyanin production. Heritability estimates for rust reaction did not exceed 20%.

3513 Domsch, K. H.
Die Raps- und Kohlschotenschwärze. **(*Alternaria* blight of rape and cabbage).**
Z. PflKrankh. 1957 : **64** : 65–79.

All *Brassica* varieties appear to be susceptible but damage may be reduced by early flowering and by the presence of a well-developed sclerenchymatous layer in the fruits and seeds.

3514 Nakagawa, H., Kamimura, S. & Sato, I.
(Studies on breeding *Brassica pekinensis*. I. Hybrid vigour in varietal and strain crosses).
Tohoku Nogyo Shikenjo Kenkyu Hokoku/Rep. Tohoku agric. Exp. Sta. 1955 : No. 4 : 133–51. [Japanese].

Fifty-four hybrid combinations were obtained from crosses involving 13 varieties. Yield increases up to 96% over the parental figures were obtained.

3515 Mullaev, T. I.
(Winter cultivation of white cabbage in Dagestan).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 10 : 20–21. [Russian].

Derbentskaja Ulučšennaja [Improved Derbent] was obtained by selection of high-yielding non-bolting types from Derbentskaja Ozimaja [Winter Derbent] at the Dagestan Horticultural Research Station. In the 1954–55 trials it outyielded all other varieties.

3516 Thompson, K. F.
Self-incompatibility in marrow-stem kale, *Brassica oleracea* var. *acephala*. I. Demonstration of a sporophytic system.
J. Genet. 1957 : **55** : 45–60.

Data from pollinations in three inbred lines and two crosses indicated that the incompatibility system depended upon sporophytic control of the pollen and style reactions and upon a multiple series of *S* alleles. One allele may be dominant over another while in other combinations of alleles both members may be active, the relationship between any two alleles being not necessarily the same in the pollen and style.

3517 Vilmorin, R. de
Variations de la teneur en fer de quelques variétés d'épinards. **(Variations in the iron content of some spinach varieties).**
CR Acad. Agric. Fr. 1956 : **42** : 722–24.

Pronounced differences in the iron contents of the leaves of three varieties of spinach subjected by the author to a chemical analysis are noted. It is suggested that more attention be paid to this aspect in breeding new varieties.

3518 Hanaoka, T.
(The influence of day length on flowering and seed production in spinach).
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1956 : No. 70 : 30–41. [Japanese].

The responses of a series of Japanese and introduced varieties to various photoperiodic treatments, including alternating 24 hr. periods of light and darkness, are described.

3519 Kagawa, A.
(Studies on floral induction in slow-bolting spinach. I. On the effect of chemical vernalization and low temperature treatment).
Engeigaku Kai Zasshi/J. hort. Ass. Japan 1956 : **25** : 173–80. [Japanese].
Varietal differences in respect of the development of the inflorescence in response to vernalization, with or without auxin treatment, are noted. The differences were more marked under short-day conditions.

3520 Finch, C. G.
Summer lettuce varieties.
Agriculture, Lond. 1957 : **63** : 527–29.
Trials have been carried out since 1954 by the National Institute of Agricultural Botany, England, to assess the commercial attributes of some of the types classified by Watts (cf. *PBA*, XXIV, Abst. 3454). This article summarizes general indications so far obtained concerning varietal behaviour.

3521 Burdine, H. W.
A study of magnesium deficiency chlorosis in certain varieties of green celery.
Diss. Abstr. 1956 : **16** : Publ. No. 16,249 : 1309–10.
Evidence was obtained suggesting that the above chlorosis, which is liable to affect varieties such as Utah 10–B and Emerson Pascal on peat soils in New York State, is due to a lowered ability to absorb Mg and not to Mg deficiency in the soil. This type of chlorosis is known to be determined by a single recessive gene.

3522 Goode, M. J. & Winstead, N. N.
Variation in pathogenicity of *Colletotrichum lagenarium*.
Phytopathology 1957 : **47** : p. 13. (Abst.).
Isolates of *C. lagenarium* from N. Carolina have been divided into three groups on the basis of their pathogenicity to varieties of cucumber, water melon and squash and it is concluded that three or more physiological races of the fungus exist.

3523 Mihov, A.
(Concerning the varieties of our commonly cultivated water melons and melons).
Selskostopan. Misăl 1956 : No. 4 : 214–19. [Bulgarian].
Bulgarian varieties are discussed with reference to early ripening, good flavour and transportability. Persiiskaja 5 [Persian 5] and Plovdiski Banani [Plovdiv Banana] are new melon varieties with fine flavour and early maturity. At Plovdiv a hybrid between these showed improved earliness and bore fruits of superior quality. The new water-melon Mramorna [Marble] produces high-quality fruits but it is a midseason type and its transportability is poor. However heterotic hybrids of Mramorna with American and Arčarska equalled Mramorna in quality and ripened 12 days earlier.

3524 Grebenščikov, I.
Über einen Fall von ontogenetischem Farbwechsel der Bastardfrüchte beim Kürbis und über die Anwendung des Begriffes "Dominanzwechsel". **(On a case of ontogenetic change of colour in hybrid fruits of *Cucurbita pepo* and on the use of the concept "dominance reversal").**
Kulturpflanze, Berlin 1956 : No. 4 : 247–76.
The green-fruited variety Zucchini Squash and the green-fruited wild species *Cucurbita pepo* convar. *microcarpa* were pollinated with pollen of the yellow-fruited *C. pepo* convar. *patissonina* var. *radiata*. All the plants of the F_1 progenies of both crosses had yellow fruits. In the early stages of the development of the fruits of the F_2 generations, the segregation ratio observed was 3 plants with green fruits to 1 with yellow fruits but, when the fruits were mature, this ratio was reversed to 3 yellow : 1 green.
The author then reviews the literature on reported cases of dominance reversal and concludes that this term has often been misapplied. It is suggested that, in future, the term be restricted in its usage and applied only to instances where change of dominance during ontogenetic development as the result of gene interaction is involved.

3525 Vigh, L.
A tök keresztezése. **(The hybridization of *Cucurbita pepo*).**
Agrártudomány 1955 : **7** : 302–03.
A method of artificial crossing by means of which a 50% fruit set has been obtained is described. Buds whose tips are just becoming coloured are prevented from opening by tying the petals together. The following day they are untied, the male flowers are picked and their anthers exposed by removal of the perianth and the pollen is applied to the stigmas of the female flowers, which are then bagged for 3–4 days.

3526 Hayase, H.
(Studies on *Cucurbita* crosses. VIII. On reciprocal interspecific crosses between *C. maxima* and *C. moschata*).
Hokkaido Nogyo Shikenjo Iho/Res. Bull. Hokkaido agric. Exp. Sta. 1956 : No. 70 : 15–29. [Japanese].

In continuation of the investigations summarized in Abst. 934, a detailed study of direct and reciprocal hybrids of the above cross is reported. Hybrids were obtained more readily when *C. maxima* was the ♀ parent and these hybrids were more vigorous than the reciprocals. The hybrids set fruit readily on back crossing but seed set and pollen fertility were low. The modal bivalent frequency in the *C. moschata* ♀ x *C. maxima* ♂ hybrid was 20_{II} but a number of meiotic irregularities were noted.

3527 Boguslawski, E. v. & Behne, R.
Die Blüh- und Befruchtungsverhältnisse bei Ölkürbis (*Cucurbita pepo* L.). [**Flowering and fertilization relationships in the oil pumpkin (*C. pepo* L.)**]. Z. Pflanzenz. 1956 : **36** : 367–94.

Observations on the course of flowering, the results of inbreeding and the effects of different sowing times and planting distances on fruit set and size in *C. pepo* are recorded. The length of the period to anthesis varied according to time of sowing from 42·2 to 51·3 days in ♂ flowers and from 44·2 to 59 days in ♀ flowers. The highest fruit sets were obtained under conditions of high temperature and high humidity. The most favourable time for artificial pollinations was between 8.00 and 9.00 hr. on the day on which anthesis took place. The pollen tubes required 4–11 hr. to effect fertilization. Full seed set was obtained even when only one half of one of the stigmatic lobes was covered with pollen, showing that pollen can pass from one section of the style to the others. Inbreeding depressed yield per plant and yield per given area but fruit weight and number of seeds per fruit were not affected. Some hermaphrodite flowers were observed but these failed to produce fruits. Some parthenocarpic fruits were obtained by hormone treatment. A cross carried out between *C. pepo* ♀ and *Citrullus vulgaris* ♂ resulted in a single fruit being formed but this fruit failed to reach maturity.

3528 Tkačenko, N.
(The heterotic cucumber hybrid Uspeh 221).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 1 : 36–37. [Russian].

Uspeh 221 [Success 221] bred at Krymskaja, Krasnodar territory, from Posrednik 97 [Intermediary 97] x Rustem 96–1, outyields Nežinskiĭ by upwards of 40%, most of the yield increase being accounted for by first fruits. The flavour of the fruits is superior to Nežinskii and the percentage of marketable fruits is higher.

3529 Ito, H. & Saito, T.
(Studies on the conditions controlling the differentiation of female, male and hermophrodite cucumber flowers. IV. The effect of growth substances on growth and sex determination of the flowers. II).
Engeigaku Kai Zasshi/J. hort. Ass. Japan 1956 : **25** : 141–51. [Japanese].

Further evidence of the effect of α-naphthaleneacetic acid in accelerating female-flower development and inhibiting male flowers is presented (cf. Abst. 2375).

3530 Chroboczek, E. & Woyke, H.
Wpływ częstości sprzętu na wysokość i jakość plonu kilku odmian ogórków konserwowych. (**The influence of the frequency of picking on the yield and quality of several varieties of preserving cucumbers**).
Roczn. Nauk rol. : Ser. A. : 1956 : **73** : 367–89.

In each of four varieties tested at the Warsaw College of Agriculture, picking of the fruits at three-day intervals as compared with daily picking resulted in higher total yields, fewer cucumbers small enough for canning being produced but more fruits suitable for pickling. Yellowing occurred in a higher proportion of fruits when picking was carried out at three-day intervals. It is suggested that breeding should be directed towards the development of more uniform varieties resistant to yellowing and requiring less frequent picking.

3531 Barnes, W. C. & Epps, W. M.
Powdery mildew resistance in South Carolina cucumbers.
Plant Dis. Reptr. 1956 : **40** : p. 1093.

SC–50 provides a valuable source of resistance to powdery mildew (*Pseudoperonospora cubensis*). It probably derived its resistance from both Puerto Rico 40 and PI197087. It is an early, productive slicing type which is also highly resistant to *Colletotrichum lagenarium*. It is however more susceptible to cold damage and *Mycosphaerella melonis* than commercial varieties.

3532 Yagyu, P. K.
The effects of X-rays and thermal neutrons on dormant seeds of tomato.
Diss. Abstr. 1956 : **16** : Publ. No. 16,568 : 1042–43.

Using the variety Puck, genetic and other effects were studied. Thermal-neutron radiation (12·83–77·00 x 10^{12} neutrons per cm.^{2}) induced higher frequencies of bridges and fragments in root-tip cells and a higher number of morphological mutants than X-ray treatment (6,000–16,000 r.). The dosage range of the X-ray regression lines for the different effects investigated was one-third to one-half that of the range of the thermal-neutron regression lines.

3533 Artemenko, G. I.
(**The tomato variety Talalihin 186**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 1 : p. 36. [Russian].

Talalihin 186 (Opolčenec [Serviceman] x Planovyĭ [Plan]), bred at Minsk, outyields Bison, ripens as early as Gruntovyĭ Gribovskiĭ [Outdoor Gribovo] and surpasses the latter in quality and flavour. It is tolerant of low temperatures and has a determinate habit.

3534 Pimahov, F. S.
(**New tomato varieties in Uzbekistan**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1956 : No. 10 : 11–13. [Russian].

Descriptions are given of Maĭkopskiĭ Urožaĭnyĭ 2090 [Maĭkop Productive 2090], Temnokrasnyĭ 2077 [Dark-red 2077] and Rannii VIRa 2094 [Institute of Plant Industry Early 2094] from the Central Asiatic Branch Station of the Institute of Plant Industry. All of these are distinguished by earliness, high yield, large fruit and high dry substance contents. The flavour of Rannii VIRa 2094 is inferior to the other two but it shows a higher degree of resistance to big bud.

3535 Flores R., I. & Richardson, R. W. (Jun.)
Variedades de jitomate para regiones semi-tropicales. (**Tomato varieties for semitropical regions**).
Agric. téc. Méx. 1955 : **1** : p. 20.

In the state of Morelos in Mexico the best-adapted commercial varieties are Red Jacket, Improved Pearson and San Marzano but some of the new lines produced by the department of agriculture have excelled them in yield and quality. Yields of up to 18 tons per ha. can be produced from some of the dwarf forms.

3536 Gottl, R. & Darley, E. C.
Greater yields and earlier fruit from hybrid tomatoes.
Agric. Gaz. NSW 1956 : **67** : 629–33.

The advantages of hybrid tomatoes, as shown by breeding at the Hawkesbury Agricultural College, NSW, are described. F_1 hybrids of Break O'Day x Rouge de Marmande [Red Marmande], Valiant x Grosse Lisse [Large Smooth], Rouge de Marmande x Grosse Lisse, Stokesdale x Potentate and Potentate x Grosse Lisse have shown particular promise in yielding ability and other respects.

3537 Glavinič [Glavinić], R.
(**Vegetative hybridization as a method for producing new tomato varieties**).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1956 : No. 4 : 27–35. [Russian].

The contents of this article are substantially the same as that summarized in Abst. 942.

3538 Czu, D.-M. [Tsu, T.-M.] & Čžao J.-S. [Chao, Y.-S.]
(**Investigation of vegetative hybridization in some Solanaceae**).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. : 1956 : No. 3 : 96–107. [Russian].

This is a fuller version of the experiments referred to in Abst. 2388.

3539 Kasahara, J., Nakamura, T. & Yoneyama, J.
(**Vegetative hybridization between the tomato varieties Yellow Pear and Marglobe**).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : p. 106. [Japanese].

In continuation of the investigations reported in *PBA*, XXVI, Absts. 1879 and 3904, the authors grafted the above varieties and state that offspring combining characteristics from both graft components were obtained in the following seed generation.

3540 Stubbe, H.
Das Verhalten der Tomaten-Mutante *reducta* in Pfropfungen und deren Nachkommenschaften. (**The behaviour of the tomato mutant *reducta* in grafts and their progenies**).
Kulturpflanze, Berlin 1956 : No. 4 : 315–24.

At the Institute for Research on Crop Plants, Gatersleben, the variety Condine Red was

grafted on to its mutant form *reducta*, which is characterized by a smaller number of locules. Slight changes in the shape and size of the fruits produced by the scion were occasionally observed but locule number was unaffected. No heritable changes were observed in subsequent generations. It was, however, found that the ungrafted *reducta* mutants displayed less variability in locule number due to environmental conditions than the variety Condine Red, which was highly sensitive in this respect to external growth conditions.

3541 Lambeth, V. N.
Tucker's Forcing. A red fruited, wilt and mold resistant forcing tomato.
Res. Bull. Mo. agric. Exp. Sta. 1956 : No. 597 : Pp. 8.

This variety, developed by the Missouri Agricultural Experiment Station, is intended for greenhouse culture. In fruit characters it resembles Bay State but it gives higher yields and is resistant to race 1 of *Fusarium oxysporum* f. *lycopersici* and to several races of *Cladosporium fulvum*. Its pedigree is given as Earliana x *Lycopersicon pimpinellifolium* 160 x Break-O-Day, selfed, open pollinated x Ponderosa, open pollinated x Greater Baltimore x Indiana Baltimore, open pollinated for three generations x Long Calyx, selfed for two generations and crossed with Bay State, selected to the ninth generation. The variety has already been used for further breeding and F_1 progeny of Tucker's Forcing x Ohio WR–3 show some of the desirable characters of Ohio WR–3 while retaining the disease resistance of Tucker's Forcing.

3542 Andeweg, J. M.
Een waardevolle vroege kruisingsouder. **(A valuable early crossing parent).**
Zaadbelangen 1956 : **10** : p. 344.

The Czech tomato varieties Stupické Polni [Stupice Field] and Ostrava BII, recently tested in the Netherlands, are noteworthy for their early maturity. Although not suitable for commercial production, these varieties may prove valuable as parents in crosses with good-quality Netherlands varieties.

3543 Zaharova, G. M.
(The inheritance of characters and properties in tomatoes in connexion with the mode of pollination).
Trud. Inst. Genet. (Trans. Inst. Genet.) 1956 : No. 23 : 78–88. [Russian].

A report on multiparental pollination of tomatoes at Gorki Leninskie, together with the results of analyses of the F_1 and F_2, is presented. Varieties were fertilized by mixed pollen of two varieties together or after a 30-minute interval. Some progeny obtained by the first mode of pollination combined the morphological characters of one parent with the maturation date and fruit weight of the other. The hybrid progeny obtained by the second pollination method included F_1 and F_2 plants which resembled both parents, but it is thought that later generations may tend to develop mainly the characteristics of the parent which had been first to provide the pollen.

3544 Richardson, R. W. (Jun.) & Alvarez L., E.
Cruzamiento natural en el jitomate. **(Natural crossing in the tomato).**
Agric. téc. Méx. 1956–1957 : No. 3 : 18, 44–45.

Seed from uncontrolled pollination of the varieties Red Jacket and Hoja de Papa [Potato Leaf], both with entire leaves, which is a recessive character, gave rise to a certain number of plants with dissected leaves; their proportions were such as to indicate a degree of cross pollination varying from 0·3 to 1·9% at Chapingo but in certain other parts of Mexico it was as high as 8·2%. The percentage of crossing was somewhat higher in the variety Red Jacket than in Hoja de Papa.
The main pollinating agent was found to be the insect *Augochloropsis ignita*.

3545 Hafen, L. & Stevenson, E. C.
A stamenless tomato mutant with abnormal corolla.
J. Hered. 1956 : **47** : 297–98.

On being crossed with Pritchard, a mutant with a green sepaloid corolla, no stamens and a low level of female fertility gave an F_1 with a normal corolla, nearly normal anthers and high female fertility. The mutant condition appeared to be governed by a single recessive gene, designated *cs*.

3546 Veselinov, E.
(Tomato varieties and our canning industry).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1956 : No. 5 : 30–31. [Bulgarian].

This survey of recent Bulgarian research on tomato breeding, in particular the breeding of varieties for canning, mentions new varieties from Negovan. These are distinguished by high yield and a dry matter content of up to 6½%.

3547 Rick, C. M.
Genetic and systematic studies on accessions of *Lycopersicon* from the Galápagos Islands.
Amer. J. Bot. 1956 : **43** : 687–96.

Investigations were carried out on three accessions of *Lycopersicon*, designated LA166, LA292 and LA317, all of which are characterized by extreme genetic uniformity, a high degree of self pollination and 12 pairs of chromosomes similar in metaphase morphology to those of other representatives of the genus. Using LA166 and LA317, crosses with species of the subgenus *Eriopersicon* failed, with the exception of crosses with *L. hirsutum* and *L. hirsutum* f. *glabratum* as males. Crosses of LA166 and LA317 were however completely compatible with *L. esculentum* and *L. pimpinellifolium*; the F_1 and F_2 hybrids with *L. esculentum* ♀ and the BC_1 to this species showed no reduction in fertility or viability compared with the parents. It is concluded from this behaviour and from morphological observations that all three accessions are members of the subgenus *Eulycopersicon*. LA317 is classified as *L. esculentum* var. *minor*, LA166 possesses the key characters of *L. pimpinellifolium*, while LA292 approaches *L. esculentum* var. *cerasiforme*. All three accessions however deviate in several unique morphological and physiological characters from their nearest known equivalents on the mainland. The orange fruit colour of LA166 and LA317 is determined by a single gene, probably identical with *B* in *L. hirsutum*. Absence of pedicel joint in LA166 depends upon an incompletely recessive gene, j_2, which is not allelic to the previously known gene *j*, now therefore designated j_1. Other differences between LA166 and LA137 on the one hand and *L. esculentum* on the other appeared to be under the control of multiple genes. The possible phylogeny of LA166 and LA317 is discussed.

3548 Rich, A. E. & Yeager, A. F.
New Hampshire Surecrop—A new tomato variety highly resistant to late blight and moderately resistant to early blight.
Phytopathology 1957 : **47** : p. 28. (Abst.).

A high degree of resistance to *Phytophthora infestans* and moderate resistance to *Alternaria solani* are combined in a new tomato variety developed at the New Hampshire Agricultural Experiment Station. Named New Hampshire Surecrop, its parentage includes New Hampshire Victor and Rockefeller Foundation Selection x 907W (*Lycopersicon esculentum* var. *cerasifolium*) which possesses a dominant gene for resistance to *Ph. infestans*. It is early maturing and gives a good yield of medium-sized fruits.

3549 Stall, R. E. & Alexander, L. J.
Heterocaryotic variation in *Alternaria solani*.
Phytopathology 1957 : **47** : p. 34. (Abst.).

Cultures from hyphal tips isolated from germinated mycelial fragments of heterocaryotic cultures of *A. solani* were found to be either heterocaryotic or homocaryotic. Cultures from germ-tube tips isolated from the same conidium showed significant differences in pathogenicity in tomatoes although they differed only slightly in cultural characteristics. Such cultures showed a greater degree of cultural and pathogenic variation than did successive vegetative generations of hyphal-tip cultures.

3550 Menon, R. & Schachinger, L.
Die Rolle des Phenols bei der Widerstandsfähigkeit von Tomatenpflanzen gegen Infektionen. (**The role of phenol in the resistance of tomato plants to infection**).
Ber. dtsch. bot. Ges. 1957 : **70** : 11–20.

More polyphenoloxidase and total phenol were found in the tomatoes Tuckswood, Pan American and Red Currant, which show resistance to *Fusarium lycopersici*, than in the susceptible variety Bonny Best. In the resistant varieties, the phenol and polyphenoloxidase content was appreciably greater in infected than in sound plants, while in Bonny Best little difference among the plants was found. Chromatographic analysis indicated that only a single phenol was involved. From the above results and from the observation that treatment of plants with the partially purified enzyme did not induce wilting, it is concluded that neither the phenol nor the enzyme is responsible for the wilting occurring on infection with *F. lycopersici*.

3551 Scheffer, R. P.
Grafting experiments with *Fusarium* wilt resistant and susceptible tomato plants.
Phytopathology 1957 : **47** : p. 30. (Abst.).

Typical symptoms of *Fusarium* wilt appeared, after inoculation of scions, in susceptible scions grafted on to resistant stocks but not in resistant scions on susceptible stocks. This is taken to

indicate that susceptibility does not depend on root-produced factors.

3552 Winstead, N. N. & Barham, W. S.
Inheritance of resistance in tomato to root knot nematodes.
Phytopathology 1957 : **47** : 37–38. (Abst.).

A tomato breeding line from the Hawaii Experiment Station, Hawaii 5229, has been found to be resistant to *Meloidogyne incognita, M. incognita* var. *acrita, M. javanica* and *M. arenaria* but susceptible to *M. hapla*. Studies of F_1, F_2 and back-cross progenies of a cross between Hawaii 5229 and Step 174 indicate that resistance to *M. incognita* is monofactorial, that the same gene also controls resistance to the other three species and that resistance is incompletely dominant.

3553 Holmes, F. O.
True-breeding resistance in tomato to infection by tobacco-mosaic virus.
Phytopathology 1957 : **47** : 16–17. (Abst.).

A tomato line which is homozygous for the gene conferring resistance to tobacco mosaic virus has been isolated and in fruit characters resembles the market-garden type of tomato. Seedlings of this line are unusual in that only short internodes develop between the first four to eight leaves although subsequent growth is vigorous and apparently normal.

3554 McRitchie, J. J.
Pathogenic strains of tobacco mosaic virus on tomato.
Phytopathology 1957 : **47** : 23–24. (Abst.).

Three strains of tobacco mosaic virus varying in their pathogenicity to tomato lines have been isolated by the use of CStMW–18 and two standard varieties. The first produces no visible symptoms on CStMW–18 and cannot be re-isolated from it, the second produces no visible symptoms on this line but the plants can be shown to contain the virus while the third produces visible symptoms on CStMW–18 and the other test varieties.

3555 McRitchie, J. J. & Alexander, L. J.
Effect of strains of tobacco mosaic virus on yields of certain tomato varieties.
Phytopathology 1957 : **47** : p. 24. (Abst.).

The existence of strains of tobacco mosaic virus of differing pathogenicity and with differing effects on the yields of tomato varieties has been confirmed by greenhouse tests using CStMW–18, Rutgers, W–R Globe and W–R Brookston, which differ in their responses to tobacco mosaic virus.

3556 Plavšić-Gojković, N.
Jedna nova solanacea. (**A new member of the Solanaceae**).
Poljopr. Znanst. Smot. 1953 : **15** : 135–48.

A description is given of a new species with edible fruits from Popovac, Croatia, which has been designated *Solanum kaki*. Tabulated information showing the differences between this species and *Solanum kupperi* is presented.

3557 Gotoh [Goto], K.
(Variance and covariance analysis applied to quantitative inheritance in the egg plant).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 180–84. [Japanese].

Continuing the line of research described in *PBA*, XXV, Abst. 3518, the author determined environmental correlations, heritability values and genotypic and phenotypic correlations between the following characters: flowering period, plant height, stem diameter, number of fruits per plant and fruit shape. The population studied was the F_0–F_4 of Kikunaga x Sendainaga 1. In general, genotypic correlations were higher than phenotypic. Fairly high positive correlations were found between flowering period, plant height and stem diameter.

3558 Hazama, K.
(Physiological and genetical studies on egg-plant grafts. I. On inter-varietal grafts and pigment analysis).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 96–100. [Japanese].

A series of grafts between egg plant varieties with differently coloured fruits was made. No evidence of vegetative hybridization was obtained.

3559 Sinoto, I. [Shinoto, Y.]
(Experiments on grafting the egg plant).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. : 1956 : No. 3 : 110–23. [Russian].

This report deals with heritable changes in fruit pigmentation obtained in the egg plant by graft hybridization in Tokyo. An explanation of the phenomena on the basis of Mendelian genetics is put forward.

3560 Isaev, S. I.
(Concerning the article "Experiments on grafting the egg plant" by the Japanese professor Yosindo Shinoto).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. : 1956 : No. 3 : 108–09. [Russian].
Shinoto's explanation of his experiments on graft hybridization of the egg plant, in which he adopts the chromosome theory of inheritance, is criticised. (Cf. Abst. 3559.)

3561 Veldbonen, 1957. **(Field beans, 1957).**
Landbouwvoorlichting 14 : Bijl. 6 : Ber. Rassenkeuze 1957 : No. 223 : unpaginated.
Data on maturity and morphological characteristics are tabulated for nine varieties and their comparative yields on different types of soil in the Netherlands are tabulated.

3562 Andeweg, J. M. & van Steenbergen, A.
Praktijkproeven met tuinbonen 1955–1956. **(Commercial trials of broad beans, 1955-56).**
Meded. Dir. Tuinb. 1957 : **20** : 133–39.
The results of trials of Dutch commercial varieties and new selections at the Institute for the Breeding of Horticultural Plants, Wageningen, are presented.

3563 Gori, C.
Aberrazioni e ritardo di sviluppo in plantule e piante di seme invecchiato di *Vicia faba* L. **(Aberrations and delay in development of seedlings and plants from aged seed of *V. faba* L.).**
Caryologia 1956 : **9** : 76–81.
Seed from the seasons 1946, 1949 and 1950 when germinated in 1955 had a lower germinating capacity than fresh seeds and the seedlings produced displayed a number of growth anomalies, which included the atrophy of the main root or stem and the development of secondary axes in their place.

3564 Down, E. E. & Andersen, A. L.
Agronomic use of an X-ray induced mutant.
Quart. Bull. Mich. agric. Exp. Sta. 1956 : **39** : p. 378. (Abst.).
An early bush mutant which segregated from X-irradiated progeny of Michelite has given rise to the new bean variety Sanilac by means of back crossing to Michelite followed by further selection at the Michigan Agricultural Experiment Station. Sanilac is superior to Michelite in respect of earliness, resistance to the α strain of *Colletotrichum lindemuthianum* and injury by the white mould fungus but the two varieties are otherwise similar.

3565 Deutsch, M.
Szárazbabfajtáink. **(Our dry bean varieties).**
Agrártudomány 1955 : **7** : 199–202.
At present *Phaseolus vulgaris* 'F. gyöngybab' [F. Pearl bean] is the only improved dry variety grown in Hungary. The best local varieties of *Ph. vulgaris* have been collected and are being bred for improved yields and disease resistance.

3566 Landbouwstambonen, 1957. **(Field French beans, 1957).**
Landbouwvoorlichting 14 : Bijl. 5 : Ber. Rassenkeuze 1956 : No. 222 : unpaginated.
Data on yield, quality and degree of resistance to diseases and pests are given for the principal varieties of brown, yellow and white field French beans grown in the Netherlands.

3567 Buishand, T.
Rond de teelt van stamslabonen. **(On the cultivation of dwarf French beans for salads).**
Med. Proefsta. Groenteteelt volle Grond 1956 : No. 4 : Pp. 75.
The results of varietal and cultural trials carried out at different localities in the Netherlands and Belgium in 1955 and 1956 are summarized and varietal differences in reaction to low temperatures and to a number of diseases, including Phaseolus virus 1 and 2, *Fusarium solani*, *Uromyces phaseoli* and *Pseudomonas phaseolicola*, are noted.

3568 Ionescu, D. *et al.*
Cele mai bune provenienţe de fasole şi propuneri pentru raionarea lor. **(The best provenance types of French bean and proposals for their regionalization).**
Anal. Inst. Cerc. agron. Român. 1954–1955 (1956) : **23** : No. 4 : 247–66.
Variety trials of five Rumanian local types indicated the superiority of Fasole de Banat [Banat French bean].

3569 Down, E. E. & Andersen, A. L.
Agronomic use of an X-ray-induced mutant.
Science 1956 : **124** : 223–24.
A bushy type of mutant induced by X irradiation of the Navy bean Michelite, which has a spreading habit, has been used at Michigan State University as the parent conferring the upright habit upon the variety Sanilac. The new variety has the following advantages over

the standard Michelite: resistance to strain α of *Colletotrichum sclerotiorum*; less tendency to be injured by *Sclerotinia* wilt since the air circulates more freely among the upright plants; earlier ripening; and the production of a lower proportion of discoloured beans under conditions of wet weather. Further investigations are required to determine whether Sanilac lends itself to combine harvesting without pulling.

3570 Račinski, T.
(Local *Phaseolus* varieties).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1956 : No. 11 : 12–13. [Bulgarian].

In the 1955 trials at Vrabevo, local varieties from the Trojan district outyielded several cultivated varieties. The best among them are large seeded and drought resistant and their flavour and cooking quality are good.

3571 Martínez L., J. & Perry, J. P. (Jun.)
Variedades mayas de frijol. **(Maya varieties of bean).**
Agric. téc. Méx. 1956–1957 : No. 3 : 14–15, 47.

Descriptions are given of a number of varieties of *Phaseolus vulgaris* and *Vigna* sp. that have been cultivated from time immemorial in Yucatan.

3572 Malinowski, E. & Bańkowska, H.
Labile characters in *Petunia* and *Phaseolus*.
Bull. Acad. polon. Sci. 1956 : **4** : 263–68.

A strain of *Ph. vulgaris* was studied in which pigmented and unpigmented epidermal cells in the testa formed a mosaic pattern, seven pattern grades with different proportions of pigmented cells being distinguished. Selection of the extreme grades for 16 generations gave two lines with slightly narrower, but still overlapping, ranges of variation than the original strain. In crosses with self-coloured strains the mosaic pattern was dominant. It is thought that pattern grades were determined by a series of alleles at a single locus, and that these alleles underwent frequent somatic mutation so that most plants of the mosaic strain were chimeras. Chimeras in which adjacent mosaic patterns differed by one grade only were most frequent. A similar series of alleles determining flower colour was found in *Petunia*.

3573 Hubbeling, N.
Toetsing van bonen op resistentie tegen vlekkenziekte. **(Testing beans for resistance to anthracnose).**
Zaadbelangen 1957 : **11** : 60–63.

Several different methods of testing bean seedlings for resistance to *Colletotrichum lindemuthianum* in the laboratory or greenhouse are compared, including the method described in Abst. 3574.

3574 van der Giessen, A. C. & van Steenbergen, A.
Een nieuwe methode voor de toetsing van bonen op resistentie tegen vlekkenziekte. **(A new method of testing beans for resistance to anthracnose).**
Zaadbelangen 1957 : **11** : 26–27.

The method described was devised at the Wageningen Plant Breeding Institute, Netherlands, and consists of laying germinating seeds on a perforated zinc sheet in a wooden box filled with soil, the roots growing through the perforations. The young seedlings are sprayed with a suspension of *Colletotrichum lindemuthianum* and the box covered with a plastic sheet to maintain a high degree of humidity, the temperature being kept constant at 15–20° C.

3575 Yerkes, W. D. (Jun.) & Teliz Ortiz, M.
Razas de antracnosis en México. **(Races of anthracnose in Mexico).**
Agric. téc. Méx. 1956–1957 : No. 3 : 8–9, 34–35.

Eleven biotypes have been identified on French bean in Mexico; one of them is identical with race β from the USA and the others are all more virulent. The most resistant varieties were Canario 101, 102 and 103 [Canary 101, 102 and 103], which were attacked only by races β and MA–7. A table is given showing the reaction of eight varieties used as differential hosts.

3576 Martinez Salazar, E. & Andersen, A. L.
Effects of temperature on spore germination and host infectivity by three strains of *Colletotrichum lindemuthianum*.
Phytopathology 1957 : **47** : p. 23. (Abst.).

Differences have been found between the α, β and γ strains of *C. lindemuthianum* in respect of their percentage germination and infective capacity against beans at different temperatures. The β and γ strains had a wider optimum temperature range for germination than the α strains.

3577 Allard, R. W.
Estimation of prepotency from lima bean diallel cross data.
Agron. J. 1956 : **48** : 537–43.

In diallel crosses among nine strains all descended from Hopi 2000 x Wilbur, the size of the seeds of each of the 36 F_1 hybrids obtained

was similar to that of the larger-seeded parent. Marked heterosis in this respect was however expressed in some combinations involving two of the strains. A method of analysing diallel-cross data led to the hypothesis that the genetic differences between the parents with regard to seed size depended on only three "genetic units" or "effective factors" and that the heterosis observed was based on the complementary interaction of two of these units. It is postulated that the third "gene" segregated as a major unit which increased seed size when dominant. Predictions made according to this hypothesis were supported by data on F_2 and F_3 segregations. The method of diallel analysis employed therefore offered a means of identifying the parents whose hybrids might be expected to provide promising material for selection for seed size. Possible applications of the method to other problems in plant breeding are discussed.

3578 Malik, H. C.
New cowpea overcomes a defect.
Indian Fmg. 1956 : **6** : No. 9 : p. 7.

The fodder variety 36/49, developed at the Fodder Research Station, Sirsa, Punjab, shows promise as a suitable substitute for the standard variety No. 1, the thick stems of which have the defect of not being easily reduced to chaff.

3579 Lorz, A. P.
New role for an old Southern crop.
Sunshine St. agric. Res. Rep. 1956 : **1** : No. 1 : 4–5.

Progress made so far and future prospects in the breeding of cowpeas in Florida are briefly discussed in this popular article.

3580 Mackiewicz, Z.
Zagadnienie uprawy soi w Polsce w świetle badań krajowych. (**The problem of soya-bean cultivation in Poland in the light of field trials**).
Roczn. Nauk rol. Ser. D. : 1955 : **71** : 1–168.

In sections I (pp. 15–52) and III (pp. 101–156) of this paper, details are given of the seed and straw yields, 1000-seed weight and vegetation period of local and introduced varieties tested at various stations in Poland during the periods 1926–38 and 1946–51 respectively. Some of the more recently developed varieties showed marked superiority over older material.

3581 Owen, C. W.
Soybean breeding successes.
Res. Frmrs., Ottawa 1957 : **2** : No. 1 : 3–4.

A short historical account of breeding at the Harrow Experimental Farm, Ont., is given.

3582 Zacharias, M.
Mutationsversuche an Kulturpflanzen VI. Röntgenbestrahlungen der Sojabohne (*Glycine soja* (L.) Sieb. et Zucc.). [**Mutation experiments on crop plants. VI. X irradiation of the soya bean (*G. soja* (L.) Sieb. et Zucc.)**].
Züchter 1956 : **26** : 321–38.

Among mutants of economic importance obtained by X irradiation at the Institute of Genetics, Halle University, and at the Institute for Research on Crop Plants, Gatersleben, were plants that matured up to three weeks earlier than Heimkraft I [Home Strength I], others that germinated at low temperatures and were resistant to frost and plants with dense foliage protecting the flowers and so able to set a large number of pods even under unfavourable climatic conditions. Also of interest were mutants with a higher 1000-grain weight than the initial material, mutants that branched more profusely and consequently gave higher yields and tall forms with a luxuriant growth suitable for green fodder. Mutants of little or no economic importance included chlorophyll-deficient forms, dwarf and stunted plants and plants in which the shape, size or colouring of the leaves, seeds or pods had been altered. In these experiments, doses of 6000–12,000 r. proved the most effective; doses above 20,000 r. had a lethal effect.

3583 (**New varieties of soya beans, 1956**).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : p. 116. [Japanese].

Two varieties have been released: Waseshiroge (= Norin 12 [Ministry of Agriculture and Forestry 12]), an early productive variety; and Asomusume (= Norin 13), a late variety of high quality.

3584 Fukui, J.
(**Studies on the pedological and ecological types of soya-bean varieties. I. On intervarietal differences in the oxidizing capacity of the roots**).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 88–90. [Japanese].

A collection of 112 Japanese varieties was classified into 6 categories in respect of the ability of the roots to oxidize α-naphthylamine. Oxidizing capacity was not correlated with vegetative period but it appears that an association exists between oxidizing capacity and adaptation to the growing conditions provided by the banks between rice fields, to virgin soil and to soils rich in humus.

3585 Fukui, J. & Yarimizu, H.
(Varietal differences in the effect of temperature after flowering on soya-bean maturation).
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 192–96. [Japanese].
The effect of a temperature 6° C. higher than normal during the period from flowering to maturation of the pods on a series of Japanese varieties was investigated. A marked acceleration in maturation was observed in the case of midseason varieties; a lesser acceleration occurred with late varieties. Early varieties were scarcely affected.

3586 Dunleavy, J. M.
A method for determining stem canker resistance in soybean.
Proc. Iowa Acad. Sci. 1956 : **63** : 274–79.
The method involves inoculating the stem tips with the fungus, *Diaporthe phaseolorum* var. *caulivora*, and measuring the rate of growth of the fungus along the stem, growth being slower in the more resistant varieties. The chief drawback is that fungal growth is retarded at the nodes, so that comparisons between varieties with different internode lengths are difficult.

3587 Frosheiser, F. I.
Studies on the etiology and epidemiology of *Diaporthe phaseolorum* var. *caulivora*, the cause of stem canker of soybeans.
Phytopathology 1957 : **47** : 87–94.
Of sixteen varieties tested in Minnesota for their reaction to *D. phaseolorum* var. *caulivora* under natural field conditions no visible symptoms appeared on Flambeau, Ottawa Mandarin or Pridesoy 11 and less than 3% of plants of Capital, Norchief and Harosoy developed infection.

3588 Nishijima, Y.
(Reduction in size of populations of *Grapholitha glycinivorella* on soya beans and the damage inflicted on the beans. Ecological studies on injurious insects and their host plants. I.)
Hokkaido Daigaku Nogakugu Hobun Kiyo/Mem. Fac. Agric. Hokkaido Univ. 1954 : **2** : 112–25. [Japanese].
In this paper, which reports a continuation of the studies referred to in *PBA*, XXIV, Abst. 3487, changes in population size of the above pest on three different varieties following initial infection rates of between 30 and 200 eggs per plant are described. The injury caused to the pods differed according to variety even when the numbers of eggs placed on them were the same. The number of initial eggs also affects the degree of damage; the oviposition rate under natural conditions is markedly affected by the presence or absence of hairs on the host.

3589 Nishijima, Y.
(On the site of oviposition of *Grapholitha glycinivorella* and the entry of the larvae into the pods. Ecological studies of injurious insects and their host plants. II).
Hokkaido Daigaku Nogakugu Hobun Kiyo/Mem. Fac. Agric. Hokkaido Univ. 1954 : **2** : 127–32. [Japanese].
The site of oviposition differs greatly in hairy and glabrous varieties. In the former, oviposition is principally on the pods; in the latter it occurs throughout the overground parts. Differences in the site of oviposition, however, seem to have little effect on the number of pods bored by the larvae.

3590 Nishijima, Y.
(Larval mortality of *Grapholitha glycinivorella*, with special reference to the growth and thickness of the soya-bean pod and seed. Ecological studies on injurious insects and their host plants. III).
Hokkaido Daigaku Nogakugu Hobun Kiyo/Mem. Fac. Agric. Hokkaido Univ. 1954 : **2** : 133–40. [Japanese].
A comparative anatomical study of the pods and seeds of five varieties was made. No correlation was detected between any particular anatomical characteristic and the degree of resistance to the above pest.

3591 Nagaoka, N., Ishikura, H., Kobayashi, T. & Tamura, I.
(Studies on the insect pests of the soya bean. III. On damage caused to soya beans by pentatomids, on the ecology of the pentatomids and on measures for controlling them).
Shikoku Nogyo Shikenjo Hokoku/Bull. Shikoku agric. Exp. Sta. 1955 : **2** : 147–95. [Japanese].
The pods of soya beans grown in southern Japan are liable to be attacked by the pentatomid bugs *Piezodorus rubrofasciatus*, *Nezara antennata* or *Dorycoris baccarum* or the coreid bug *Riptortus clavatus*. Some varietal differences in incidence of attack have been noted, late varieties being less seriously affected, presumably because the bug populations decrease as the season advances.

3592 LAMPRECHT, H.
Röntgen-Empfindlichkeit und genotypische Konstitution bei *Pisum*. (**X-ray sensitivity and genotypic constitution in *Pisum***).
Agri hort. genet., Landskrona 1956 : **14** : 161–76.

Exposure of soaked seeds of three lines to 5000 r. had no effect upon germinating capacity. Irradiation with 10,000 r. inhibited germination in two of the lines but not in the third, which differed from the others in carrying the dominant genes *R*, *V* and *N*. In further experiments involving 11 lines and 15 genes, it was found that lines homozygous for *r* were highly sensitive to dosages of 6000 r. or more. Differences in sensitivity were also observed among four lines carrying different interchanges.

3593 LAMPRECHT, H.
Die Koppelung des interspezifischen Gens *lac* von *Pisum*. (**The linkage of the interspecific gene *lac* of *Pisum***).
Agri hort. genet., Landskrona 1956 : **14** : 185–94.

Data are presented which indicate that the gene *Lac* (cf. Abst. 3594) lies between genes *D* and *I* on chromosome I, the crossing-over value for *D–Lac* being 32·5% and for *Lac–I*, 39·6%. The sequence *Con–Tra–Le–V* is established for chromosome IV (cf. *PBA*, XXVI, Abst. 3941). The previously determined order of *Gp–Fs–Ust* on chromosome V was confirmed, but the crossing-over values were significantly smaller than those obtained earlier (cf. *PBA*, XXIII, Abst. 3118).

3594 LAMPRECHT, H.
Neues Auftreten der Mutation im interspezifischen Gen *Lac* von *Pisum*. (**New occurrence of mutation in the interspecific gene *Lac* of *Pisum***).
Agri hort. genet., Landskrona 1956 : **14** : 177–84.

Mutant plants characterized by abnormal development of the leaves and flowers and by complete male and female sterility have been found in the progenies of various crosses. The character was determined by a single recessive gene designated *lac*, certain differences in inflorescence development among the mutants appearing to depend upon differences in genotypic background. Data on material studied over 27 years indicate that the frequency of mutation of the gene *Lac* is significantly higher in crosses than in uniform lines, and this observation, together with similar results for other genes, suggests that mutation may increase as a result of wide genotypic differences between parents.

3595 ŽEBRAK, A. R.
(**The nature of grafts in higher plants**).
Bot. Ž. (Bot. J.) Moskva 1956 : **41** : 358–70. [Russian].

A full account of the experiments referred to in Absts. 964 and 965 is given.

3596 LAMPRECHT, H.
Ein *Pisum*-Typ mit grundständigen Infloreszenzen. (**A *Pisum*-type with basal inflorescences**).
Agri hort. genet., Landskrona 1956 : **14** : 195–202.

A number of plants in the F_2 of the cross 614 x 924 flowered at a lower node than is normal. F_3 data indicated that two recessive genes were segregating, one determining the development of about two sterile nodes below the first flowering node and the other the production of four or five sterile nodes. The two genes are designated *Ib* and *Iba*. It is suggested that these genes may be useful in breeding for earliness.

3597 SCHNEIDER, A.
Pflanzenphysiologische Grundlagen für die Qualitätsbeurteilung und Qualitätszüchtung von Erbsen. (**Plant physiological bases for judging the quality of peas and breeding for quality**).
SB dtsch. Akad. LandwWiss. Berl. 1956 : **5** : No. 9 : Pp. 29.

Studies of a number of varieties of peas for culinary and canning purposes showed significant differences in the rate of starch hydrolysis and stage at which the maximum content of raw sugars in the seeds was reached. A high positive correlation was established between the firmness of the peas and their dry matter contents. Sugar content and starch content were negatively correlated. Temperature was found to be the most important external environmental factor affecting the maturation periods of the varieties studied. Data are provided on the effect of sudden spells of cold weather on the maturation period and quality of the peas of a number of varieties. Techniques for determining the culinary properties of dried peas (cf. *PBA*, XXV, Abst. 3538) and the suitability of peas for canning and preserving are provided. The importance of the above findings on breeding new varieties of pea with improved culinary or preserving qualities is indicated.

3598 Drozd, A. M.
(Development of overwintering pea varieties for the submontane zone of the Krasnodar territory).
Trud. Kišin. seljskohoz. Inst. (Rep. Kišin. agric. Inst.) 1956 : No. 22 : p. 173. [Russian]. [From Ref. Ž. : Biol. (Abst. J. : Biol.) 1956 : No. 22 : Abst. 94894].

New varieties of peas and garden peas have been bred at Krymskaja, Krasnodar. They are all hardy under North Osetian conditions, in the Crimea, the Herson province and in Moldavia; they outyield the spring varieties by 20–25%.

3599 Olgyay, M. & Lehoczky, J.
A borsófajták Ascochytás érzékenysége, fungicidek stimuláló hatása és permetezés. **(The susceptibility of pea varieties to *Ascochyta* and the stimulating effect of fungicides and spraying).**
Kertész. szőlész. Főiskol. Évkön. 1953 : **17** : 113–26.

Varietal differences in reaction to infection with *Ascochyta pisi* and in consistency of reaction have been observed among 30 varieties tested at stations in Hungary.

3600 Sörgel, G.
Die Problematik der bisherigen Vorstellungen über die Resistenz gegen pilzliche Krankheitserreger, erläutert am Beispiel der Fuss- und Fleckenkrankheit der Erbsen. **(The question of ideas up to the present on resistance to fungal pathogens, illustrated by the example of foot rot and leaf and pod spot in peas).**
SB dtsch. Akad. LandwWiss. Berl. 1956 : **5** : No. 16 : Pp. 20.

Experiments indicated that resistance in the pea to *Ascochyta pisi*, *A. pinodella* and *Mycosphaerella pinodes* is correlated with the rate at which these fungi are able to produce fruiting bodies. Resistance is determined, in the case of *M. pinodes*, by the amount of anthocyanin in the testa of the host. In the case of the two other pathogens, resistance is conditioned by the chemical composition of the sap, in particular the ratio of starch to sugars, although certain inhibitory substances may also play a role. It is therefore suggested that biochemical analysis offers an effective means of determining the degree of resistance or susceptibility of a given variety and that this method is also applicable to plants other than the pea.

3601 Buxton, E. W.
Some effects of pea root exudates on physiologic races of *Fusarium oxysporum* Fr. f. *pisi* (Linf.) Snyder & Hansen.
Trans. Brit. mycol. Soc. 1957 : **40** : 145–54.

Root exudates from Onward, Alaska and Delwiche Commando peas were found to suppress the germination of spores of the races of *F. oxysporum* f. *pisi* to which they were resistant. In agar cultures root extracts from resistant varieties inhibited mycelial growth while with extracts from susceptible varieties growth of the mycelium was stimulated. Sections of the roots made at seven-day intervals after inoculation showed that races of the fungus to which the varieties were resistant only penetrated the outer cortex, while races to which they were not resistant rapidly penetrated the inner cortex and vascular region.

3602 King, T. H., Bissonnette, H. L. & Johnson, H. G.
Status of studies on developing lines of *Pisum sativum* resistant or tolerant to *Fusarium* root rot.
Phytopathology 1957 : **47** : p. 20. (Abst.).

Crosses have been made between 14 lines resistant or tolerant to *F. solani*, *F. oxysporum* var. *pisi* form 2 and *Aphanomyces euteiches*. The percentage survival of ten lines, which have now reached the F_6 and F_7 generations, selected from these crosses, has been greater than that of either parent line, while several other lines in earlier generations also appear promising.

3603 Yen, D. E. & Cruickshank, I. A. M.
Wilt-resistant Greenfeast peas.
NZ J. Agric. 1957 : **94** : p. 149.

Lines of Greenfeast resistant to wilt (*Fusarium orthoceras* var. *pisi*) have been selected. Incorporation of wilt resistance in William Massey and Onward is in progress.

3604 Pavel, I.
Cele mai bune populații de năut pentru Moldova. **(The best populations of chickpea for Moldova).**
Anal. Inst. Cerc. agron. Român. 1954–1955 (1956) : **23** : No. 4 : 267–74.

Variety trials of four populations at the Iasi experimental station in 1951–52 indicated the superiority of Năut galben de Lovrin [Lovrin Yellow chickpea].

3605 Argikar, G. P.
Some qualitative and quantitative observations on the genetic improvement of a green seeded strain of *Cicer arietinum* L.
Indian J. Genet. 1956 : **16** : 52–56.
Differences have been found at the Agricultural Research Station, Bijapur, Bombay State, between varieties in respect of protein and ascorbic acid content of the seeds, the small, green seeded variety Hara Chana being superior to larger-seeded yellow varieties. Preliminary breeding work has resulted in the development of a large, green-seeded strain rich in protein and ascorbic acid and giving fairly good yields.

3606 Bhattacharjee, S. K.
Study of autotetraploid *Cajanus cajan* (Linn.) Millsp.
Caryologia 1956 : **9** : 149–59.
Tetraploids obtained from the seed of a single colchicine-induced $4n$ plant had significantly lower numbers of branches and nodes on the main stem than the diploid controls. The $4n$ and $2n$ plants showed only slight differences in leaf and leaflet measurements and in leaf number. The tetraploids were in general more variable in growth rate and in the other characters studied than the diploids. Multivalent formation and irregularity in disjunction in the $4n$ plants resulted in $62{\cdot}4 \pm 11{\cdot}01\%$ of abortive pollen grains, the average size of which was $42{\cdot}4 \pm 4{\cdot}5\ \mu$. The average sizes of the fertile pollen grains of $2n$ and $4n$ plants were respectively $47{\cdot}17 \pm 0{\cdot}12\ \mu$ and $50{\cdot}34 \pm 7{\cdot}8\ \mu$.

3607 Brunson, A. M. & Escarlos, J. D.
Sweet corn in the Philippines.
Philipp. Agric. 1956 : **39** : 528–34.
The open-pollinated varieties Philippine Sweet and Hawaii Sweet were crossed with each other and with introduced inbreds or Golden Cross Bantam. In a trial of the various hybrids, the crosses of Golden Cross Bantam with Philippine Sweet and Hawaii Sweet had the best quality and were among the combinations giving the highest yield.

3608 Dániel, L.
Über die Züchtung von Zuckermaisheterosissorten. (**On breeding heterotic varieties of sweet corn**).
Acta agron., Budapest 1956 : **6** : 241–42.
Of 50 hybrid combinations tested in preliminary trials in Hungary, 38 outyielded the controls, eight of them significantly. Sweet corn varieties have been crossed with waxy maize with wrinkled endosperm, with the aim of increasing sucrose content, decreasing starch content and extending the period during which the ear is suitable for consumption. The production of varieties with easily removed kernels by crossing with a maize type with reduced bracts and exposed ears is meeting with some difficulty since the male inflorescence in such plants is also unprotected and the pollen fails to develop.

3609 Djjačenko, V. S.
(Heritable changes in sweet corn in connexion with environmental training).
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. : 1956 : No. 3 : 50–52. [Russian].
Changes in the biochemical properties of the grain of the variety Pionerka Severa [Pioneer of the North], said to be heritable, were obtained at Gribovo by growing the variety for several generations on soils dressed with NPK, NP or PK.

3610 Ikeda, N. & Udo, S.
(Studies on mint breeding. V. Cytogenetical studies on the F_1 between Japanese mint and the pilose form of *M. spicata* L.).
Okayama Daigaku Nogakubu Gakujutsu Hokoku/Sci. Rep. Fac. Agric. Okayama Univ. 1955 : No. 7 : 1–7. [Japanese].
The F_1 hybrid of the above cross has $2n = 72$ chromosomes, compared with 96 somatic chromosomes in Japanese mint and 48 in the *M. spicata* parent. The hybrid was highly pollen-sterile but set a few seeds by open pollination or back crossing. Its modal meiotic configuration was $16_{II} + 40_{I}$. (Cf. *PBA*, XXVI, Abst. 2968).

3611 Tsuda, C.
[Cytological studies on *Mentha* plants. III. On meiosis in the F_1 of *M. viridis* L. subsp. *crispata* Briquet x *M. rotundifolia* (L.) Huds.].
Ikushugaku Zasshi/Jap. J. Breeding 1956 : **6** : 126–32. [Japanese].
The respective somatic chromosome numbers of the parents are 48 and 24. Two types of hybrid were produced, one having maternal and the other paternal affinities; in both cases, $2n = 36$. Meiosis was studied in the maternal type and found to be highly irregular; it is inferred that the genomes of the parent species are unrelated.

Dixon, W. J. & Massey, F. J. (Jun.)
Introduction to statistical analysis.
McGraw-Hill Book Co., Inc., London 1957 : 2nd Ed. : 45s. : Pp. xiii + 488 : tables.

This textbook is written for a basic course in statistics to be taken by students from all fields in which statistics finds application. Except in a final chapter on probabilities the only mathematics needed is a knowledge of elementary algebra. The following summary of the chapter headings will indicate the scope of the book: Histograms, Measures of location and dispersion, Samples, Normal distribution, Confidence intervals, Testing hypotheses, Analysis of variance, Regression and correlation, Covariance analysis, Chi-square and discrete distributions, Operating characteristics, Efficiency, Non-parametric methods, Sequential analysis, and Probability. A major feature of the book is the appendix of tables which extends to more than 100 pages. The main changes from the first edition are that the chapters on Measures of location and dispersion, Testing hypotheses, and Analysis of variance have been partly or entirely rewritten, and a new chapter on Probability included.

The book is, on the whole, well written with the proper emphasis and is to be recommended to anyone wishing to acquire a considerable amount of statistical knowledge, in so far as it concerns inference procedures, with a minimum of mathematics. Its principal defect is that it covers too many topics, with the result that individual items are often treated in too cursory or terse a fashion. For example the treatment of components of variance in three pages is too short to show the considerable importance and range of applications of the method. The same remarks apply to the tables, which include such recondite items as tables of power of the analysis of variance test. On the other hand this broad coverage does have its advantages: for example it will draw readers' attention to methods that they might otherwise not have known about.

The book gives a good idea of what modern statistical inference is about: for detailed understanding of particular topics supplementary reading is desirable, and the authors give adequate references to enable this to be done. They are to be congratulated on producing one of the better books in the field. D. V. L.

Kendall, M. G. & Buckland, W. R.
A dictionary of statistical terms.
Oliver and Boyd, Edinburgh and London 1957 : 25s. : Pp. ix + 493.

In their introduction to the above work the authors express their justifiable anxiety that it "may become normative". It is in fact an extremely useful compendium of definitions of or information on statistical terms and is completed by glossaries of statistical terms in French, German, Italian and Spanish and their English equivalents.

The invitation to prepare the dictionary came from the International Statistical Institute and under the auspices of UNESCO. The work of preparation was done at the Research Techniques Unit of the London School of Economics and Political Science. Numerous other statisticians were invited to criticize the draft entries. Over a thousand statistical terms are explained, most of which are in current use. The explanations are concise and clear and the authors take considerable pains to dissociate themselves from controversial positions. Occasionally views on nomenclature are expressed as with the term *aleatory* for which no use in the English language is seen. Of special value to English readers are the numerous explanations of Italian statistical terms, many of which have no exact equivalent in English. Some of the accounts of statistical tests are rather nebulous, especially as it was not found possible to include any detailed references.

The French, German, Italian and Spanish glossaries are a valuable addition and will greatly assist English readers of foreign statistical papers. In general the compilation of this part of the dictionary has been carefully done. There are occasional obscurities. Thus, the implied distinction between the Italian terms *coefficiente di correlazione del Bravais* and *coefficiente di correlazione di Bravais* seems unlikely and while compounds of the German *Gitter* are correctly equated with *lattice*, *Gitter* alone is merely equated with *grid*.

The rapid advances in statistics in the last twenty years render it difficult for all save exceptionally mathematically inclined biologists to keep abreast with current statistical literature. A source of reference of statistical terms is therefore an indisputable need. Statistics has been most assiduously cultivated in English-speaking countries and its terminology is moulded by this fact. All readers of statistical papers in other languages will have encountered the difficulties caused by faltering nomenclature and the frequent necessity of quoting English equivalents to remove ambiguity. The present work might well stabilize nomenclature in the languages with which it deals and so make a significant contribution to international science.

Dobzhansky, T.

The biological basis of human freedom.

Columbia University Press. London: Oxford University Press 1956 : 18s. 6d. : Pp. vi + 139.

This small volume embodies, in a slightly expanded form, the Page-Barbour lectures delivered at the University of Virginia in March 1954. The speaker was at pains to substitute the concept nature *and* nurture for the old-fashioned formulation nature *or* nurture which has led to so many unnecessary discussions and engendered so much heat and ill feeling. The Darwinian theory is explained in the light of modern biological thought, emphasis being laid on the cooperation between members of communities as well as on the competitive aspect of natural selection. Natural selection is said to be "neither egotistic nor altruistic; it is opportunistic. It perpetuates those genetic constitutions which happen to exhibit a fitness superior to others at a given time, in a given place, and in a given environment".

We are given examples of learning in the lower orders, for example the tits that open milk bottles, and of symbolic transmission of information such as the bee dance, but the thesis presented—one might even say laboured, since it is so often repeated—is that man, by developing his brain and the transmission of his culture, instituted "a third kind of history", superimposed upon cosmic and upon biological evolutionary histories. It is a comfortable doctrine and no doubt found popularity with the audience to whom the lectures were addressed. Critical readers, and those who entertain doubts as to the direction in which human evolution is now proceeding, may find their fears dismissed somewhat lightly in the statement that "natural selection does not necessarily favor what we may regard as desirable"; and may consider that the author succumbs to an almost governmental suavity of understatement in his conclusion that "it is perhaps not unduly optimistic to hope that an improved understanding of human biology and a greater diffusion of biological knowledge may make such a plan for steering his own evolution realizable in practice."

Sanders, F. K. (Editor)

Symposia of the Society for Experimental Biology. No. 10. Mitochondria and other cytoplasmic inclusions.

University Press, Cambridge 1957 : 55s. : Pp. vii + 198 : figs. : tables : plates.

The tenth symposium of the Society for Experimental Biology held at Oxford in September 1955 was devoted to cytoplasmic inclusions. Several of the contributions were concerned with the Golgi complex, others with the fine structure of the protoplasm in various animal tissues. In The enzymatic heterogeneity of cell fractions isolated by differential centrifuging, by C. de Duve, evidence is presented in favour of the assumption that a group of hydrolytic enzymes, including ribonuclease, deoxyribonuclease, cathepsin, and β-glucuronidase, resides in granules enclosed by semipermeable membranes, referred to as lysosomes, which are distinct from and smaller than the mitochondria. In Cytoplasmic particles of plant roots, J. Chayen and S. Fitton Jackson describe observations made on individual cells isolated from roots of *Vicia faba* after "mummification" with polyvinyl alcohol and give evidence for concluding that the larger granules seen in the root meristem are mitochondria and contain ascorbic acid and phospholipids. Initial attempts to examine the root meristem cells in the electron microscope showed the presence of granules, some 400 Å. in diameter, containing high concentrations of ribonucleic acid, and mitochondrial granules about 0·5 μ in diameter which occur in the meristematic cells. In Phase-contrast and interference microscopy in the study of cell structure, R. Barer and S. Joseph emphasize the importance of mitochondria, as being the site of greater biochemical activity than the nuclei and chromosomes, and make a strong plea for more research to be carried out upon them, the possibilities of interference microscopy in investigating these structures in living cells being expounded. Observations are reported which show that in insect spermatocytes the mitochondria undergo slow rotation around the nucleus and that at the time of meiosis they seem to have some special connexion with the synthesis and lysing of the nuclear membrane. It is even suggested that antimitotic substances may exert some or all of their action by interfering with the mitochondria.

Chromosomes. Lectures held at the conference on chromosomes held in Wageningen on 16-19 April, 1956.

W. E. J. Tjeenk Willink, Zwolle 1956 : f. 8.10 : Pp. 231 : figs. : tables.

Some years ago the Senate of the Agricultural University of Wageningen undertook to organize a series of international conferences on fundamental subjects of wide scientific interest, to be held every two or three years at the Centre of Agricultural Science. The conference on

Chromosomes is the first of the series. This volume gives the text of the seven lectures delivered, which represented contributions from the points of view of the biochemist, cytologist and breeder. The papers have already received brief notice in Abst. 1138.

The first paper, by E. Heitz, Die Chromosomenstruktur im Kern während der Kernteilung und der Entwicklung des Organismus (Chromosome structure in the nucleus during nuclear division and the development of the organism), is a general review of the subject, though tending to deal more with earlier than later work in this field. Among the topics covered are the spiral structure of the chromosomes, chromosome constrictions, the distribution and significance of heterochromatin and changes in chromosome structure during development.

H. D. Springall, in Some aspects of the chemical structure of proteins and nucleic acids, provides a useful synopsis on the chemistry of these substances and on the methods used to determine the chemical configuration of such complex molecules and to attempt their artificial synthesis.

T. Caspersson is well known as a pioneer in the field of absorption spectromicrography. In his contribution on the Cytochemistry of nuclear elements, a general account is given of the techniques that have been used successfully in the past and some new methods, in particular, determination of optical constants on model substances, are outlined. The principal results obtained by these techniques, notably information on protein and nucleic-acid metabolism during the nuclear cycle, are summarized.

There is a tendency for geneticists to pontificate on the role of nucleic acids in inheritance. All such should read N. W. Pirie's mocking article on The recognition, distribution and action of nucleic acids. In this paper, the adequacy of methods for identifying and localizing DNA and RNA is examined. It emerges that there may be "no nucleoproteins in a strict sense but only particles kept together mechanically and associations depending on electrostatic attraction". The evidence for supposing that genes consist of DNA is overhauled with scepticism and though it is granted that "this is a possible, even a plausible, simplification . . . it does not by any means follow logically from the observations that have been made." The recent vogue of "non-objective approaches" to the role of RNA in protein synthesis and speculations on transfer of information from nucleotide assemblages to aminoacid sequences (cf. *PBA*, XXVI, Abst. 864) are treated with asperity. Gamow and Yčas are stood in the pillory and informed that "a protein-synthesising system, designed by an eminent physicist, would no doubt resemble these speculative productions, but there is no reason to think that any of the systems in which we are interested were designed by physicists."

L. Ehrenberg, Å. Gustafsson and D. von Wettstein collaborated in compiling a paper on Studies on the mutation process in plants—regularities and intentional control, in which a considerable amount of published work, mostly of Swedish origin, and some hitherto unpublished results are discussed. As is shown by the data first reviewed, ample evidence has now accumulated that the "mutation spectrum" varies with the type of species and mutagenic agent (cf. *PBA*, XXV, Absts. 155–75). The results of recent work on the effects of some chemicals in inducing chlorophyll mutants in barley are among those considered. Chromosome breakage and sterility due to the consequent cytological irregularities may be induced by a chemical such as 8-ethoxycaffeine without production of chlorophyll variants. Others, e.g. ethylene oxide and the mustards, may simultaneously cause breakage, sterility and a high frequency of mutation. Treatment with still others, such as nebularine, may considerably increase the rate of mutation but not give rise to breakage and sterility. The chemicals mentioned differed qualitatively and quantitatively with respect to the mutants induced, the mutation spectrum provoked by nebularine showing the greatest divergence from the spectrum obtained with X and neutron irradiation. The problem of productivity in induced mutants is then considered, again chiefly with reference to barley. Translocations induced by either densely or sparsely ionizing radiations are not as a rule associated with a deleterious effect upon grain yield (cf. *PBA*, XXVI, Abst. 3313). In a few cases translocations may even lead to greater productivity, possibly because a better adjustment of genes and chromosomal segments has ensued. Translocations are rarely instrumental in inducing morphological and ecological changes, which are usually accomplished by genic mutation with pleiotropic effects. The expression of the mutations may range from superdominance and complete dominance to complete recessiveness. After expressing the view that all characters of agronomic value in any crop may be improved upon by induction of mutation while still others may be created *de novo*, the authors discuss in detail early

mutants and the *erectoides* series in barley. Earliness is frequently attained by a reduction of vegetative growth; a few mutants for earliness are however capable of giving high yields of grain. As in the *erectoides* types, increased stiffness of straw is brought about by reduction in total height, a tendency towards a low number of internodes, decrease in the length of the basal internode and increase in the length of the uppermost one or two internodes. The main features of the more drastically changed *erectoides* series are well-known from previous papers by the authors and their colleagues. It is however interesting to note that, according to data from tests during 1952–55, two from this series, ert 23 and ert 32, are equal in lodging resistance to Herta and superior in this respect to Bonus. They are both more productive than Herta and on a nitrogen-rich soil may equal or exceed Bonus in yield. In conclusion, some procedures for improving various kinds of crops by the method of directed mutation are suggested. For the full exploitation of this method, properties such as root development, anatomy, photosynthesis and synthesis of proteins, carbohydrates and alkaloids require analysis on an agronomic basis. As an example of the value of such an approach, work on the relationship between stem structure and lodging in cereals by Wettstein is cited. This analysis revealed that in breeding barley for straw stiffness a lower number of internodes and more satisfactory distribution of internode lengths should be sought whereas in wheat the cross-sectional area of the internodes requires to be increased. Other possibilities envisaged include the induction of back mutations in highly-bred crops in which an accumulation of recessive traits may be present and induction of small deficiencies by an agent such as diepoxybutane as a means of eliminating unwanted characters.

A. Müntzing contributes a review on Chromosomes in relation to species differentiation and plant breeding. The first and shorter section is devoted to surveying some of the literature on the role of disparities in chromosome structure and of aneuploidy in the differentiation of species in a number of economic and non-economic plant genera. In the second part he discusses polyploidy along familiar lines, describing reported examples of resynthesis of polyploid cultivated plants, summing up general experience in attempts to develop polyploids of economic importance and assessing the progress so far achieved; he refers in the main to work in Scandinavia and to apple, pear, sugar beet, turnip, clovers, rye and *Triticale*.

C. D. Darlington may be relied upon to follow if possible new directions of synthesis. In Messages and movements in the cell he applies his aptitude for being in the vanguard of hypothesizing to an exploration of interactions between components of the cell in physico-chemical terms. In the development of the view that the cell may be regarded as a system of interactions between nucleus and cytoplasm, mitosis and meiosis are interpreted as involving different timing relations in such interactions: the results of a diversity of experimentally-induced abnormalities are discussed in this connexion. The author postulates the following modes of genetic organization and action. Not only are the chromosomes laterally polymeric or polynemic but they have linearly repeated parts differing in function and hence presumably in chemical and genetic nature. The functions are revealed by the "property possessed by many genetic particles (in the nucleus or the cytoplasm) of attaching their products to them". These products "are the specific and direct products of particular compound or multiple genes which may be described as organellar genes . . . Centromeres and chromomeres, nucleolar organizers and heterochromatin, show organellar behaviour which is conditional in two ways. Subject to the cytoplasm it varies cyclically in mitosis and in the whole of development. Subject to the genotype it varies between individuals and species. The common alternative to attachment is free diffusion which underlies the combined or total nuclear activity. This integrated activity is what we describe as the genotype controlling for long term purposes the cycles of mitosis and meiosis. A third type of gene action may be recognized where products of activity are *canalized* along the chromosome. This produces centric gradients which affect reproduction and spiralization in mitosis as well as pairing, crossing over, and centric and general reproduction in meiosis. It produces block effects seen in the differentiation of heterochromatin. And it produces the position effects recognized in breeding experiments . . . There are two main types of cooperation between genes, giving compound or multiple genes which vary quantitatively. There is complementary cooperation of unlikes in euchromatin and supplementary cooperation of likes in organellar genes. Similar quantitatively differing organellar genes (centromeres or nucleolar organizers) compete when they are situated at different places . . . Further, the different kinds of organellar and other genes cooperate not only in their visible functions but also in diverse ways in providing

the conditions for the formation of the nuclei, for their maintenance without and with protein production, and for the specific and perhaps maximum requirement of reproduction itself." Possibly the intractabilities of the task attempted have led the author to concoct such extraordinary expressions as: "dead-end cells like pollen grains" (p. 205); "The . . . general hurrying of nucleus and cytoplasm together" (p. 208); and in referring to the complementary relationship between two differently defective nuclei in the same cell: "But fusion apparently cannot occur. It is as though they love one another but cannot get married. Perhaps co-nuclei never can" (p. 216).

GUTTENBERG, H. VON
Embryologische und histogenetische Untersuchungen an Monokotyledonen. (**Embryological and histogenetic investigations on monocotyledons**).
Gustav Fischer Verlag, Jena 1957 : DM 16.40 : Pp. viii + 161 : figs. : plates.

The present volume of this series is based on two doctoral dissertations and three diploma dissertations submitted to the University of Rostock. The articles have been edited by Prof. H. von Guttenberg, Director of the Botanical Institute.

The doctoral dissertations were submitted by H. Pankow and H.-R. Heydel. The first is a comparative study of the development of various types of monocotyledonous embryos. Special attention is paid to the primary root which, it is concluded, is really homologous with a secondary root. The second is a comparative study of the ontogeny of primary, secondary and adventitious roots in selected monocotyledons.

The first of the diploma dissertations is based on the work of C. Jakuszeit and deals with embryonic and primary-root development in *Galtonia candicans* and a comparison between this plant and *Alisma plantago*. In the second, A. Semlow describes studies on the embryology of the Cyperaceae and concludes that the cotyledonary sheath is homologous with the coleoptile of the grasses. The last paper, based on the work of I. Riebe, is concerned with the embryology of the Bromeliaceae.

All the articles are elaborated in the light of traditional morphological categories, and are brought into line with the scheme of descriptive embryology devised by D. A. Johansen.

TROLL, W.
Praktische Einführung in die Pflanzenmorphologie. Zweiter Teil: die blühende Pflanze. (**Practical introduction to plant morphology. Part two. The plant in flower**).
Gustav Fischer Verlag, Jena 1957 : DM 26.40 : Pp. viii + 420 : 406 figs.

The first volume of this work was reviewed in *PBA*, XXV, p. 102; it dealt with the morphology of the root and shoot. The present volume is in two parts, devoted respectively to the flower and inflorescence. As in the first volume, the treatment in the present one is illustrative rather than theoretical. However, there are two sections on the theoretical basis of the system of morphology favoured by the author, one on the interpretation of the flower as a shoot and the other on the principles of inflorescence formation. As would be expected, the theoretical views expounded by Professor Troll are based on Goethe. In this volume, in fact, we have here one of the best up-to-date expositions of traditional morphology. The morphological equivalences between different plant organs are indicated mainly by examples of intermediate structures. No attempt is made to establish morphological categories by rigorous logical analysis; indeed Professor Troll would probably regard such an approach as improper in the domain of pure morphology.

The present volume consists of 37 sections; of these, two (Nos. 1 and 28) are theoretical, sixteen deal with the floral organs, their interrelations and modifications, eleven describe selected types of fruit, while the rest are concerned with the various types of inflorescence. The examples are well chosen and very well illustrated.

It is well known that Prof. Troll has broken new ground in his studies of the morphology of the inflorescence. In the present volume, only the traditional interpretation is given. However, the possibility of incorporating these advances in a later edition is envisaged and would certainly add greatly to the interest of the complete work.

FASSETT, N. C.
A manual of aquatic plants.
The University of Wisconsin Press, Madison 1957 : 2nd Ed. : $6.50 : Pp. ix + 405 : illus.

The second edition of this manual has largely been completed, after the author's death, by Dr. E. C. Ogden. Such revisions as have been made are included in a Revision Appendix, the

primary purpose of which is to bring the nomenclature into agreement with present-day usage but which also includes several revised keys. The region covered is the eastern United States, from Minnesota to Missouri and eastward from the Gulf of St. Lawrence to Virginia, although details are given of the distribution of the species described throughout the USA, and the plants included are those which, according to the author, may, under normal conditions, germinate and grow with at least their bases in water and which are large enough to be seen with the naked eye. Dichotomous keys are provided to aid identification and the book is illustrated by unusually clear and artistic line drawings. A fascinating appendix gives details of the use made of aquatic plants by birds, mammals and fish and the book is completed by a glossary and a revised index.

FASSETT, N. C.
Spring flora of Wisconsin.
University of Wisconsin Press, Madison 1957 : 3rd Ed. : $2.50 : Pp. vi + 189 : illus.

This attractive little book was being revised by the author at the time of his death and the third edition has been completed by M. S. Bergseng. All plants flowering before 15 June are described briefly, keys being provided for the identification of families and genera and of species within the larger genera. The important features of many species are illustrated but some of the drawings suffer from being too small and scrappy and too crowded. The book is completed by a glossary and an index including Latin and English names.

Plant Protection Conference 1956.
Butterworths Scientific Publications, London 1957 : 50s. : Pp. xi + 315 : figs. : tables : plates.

This attractive volume embodies the proceedings of a conference held in June 1956 at the Fernhurst Research Station, England, to discuss the wider issues raised by the modern upsurge of research on crop protection. It contains the texts of the papers presented and of the addresses of chairmen of sessions, together with full verbal reports of the discussions. The first session comprises the opening address by Sir Frank Engledow and the paper by J. G. Knoll on World aspects of plant protection, which gives an outline of the gradual development of international cooperation for the purposes of plant protection. The second session was devoted to genetics and opened with a paper by W. F. Hanna on Genetics in relation to crop protection; the speaker examined the contribution that genetics can be expected to make towards the solution of plant protection problems. Many cases of successful breeding of disease-resistant varieties are cited but the problem presented by the biotypic variation of the pathogen is emphasized, reference being made to some 15,000 biotypes of *Ustilago zeae*, to 1000 of *Helminthosporium sativum* and to 14 distinct strains of race 15B of stem rust, one of which attacks even the variety Selkirk. The possible solution of the problem by growing several varieties possessed of different resistances, or of composite varieties comprising several strains, is mooted. The next paper was The physiology of immunity of some agricultural plants by K. T. Suchorukov, who stressed the importance of a study of the physiological aspects of the host-pathogen relationship for an understanding of resistance; cottons resistant to *Verticillium* wilt have been found to have denser wood, larger medullary rays, more starch in the medullary rays, smaller intercellular spaces and thicker cell walls; the fungus penetrates the resistant plants but tyloses are formed in the vessels and the fungus does not spread. Rust-resistant wheat plants were found to contain more ammonia; cereals and roses affected by mildew displayed reduced photosynthesis; various rotting fungi attacked plants more readily when their photosynthetic activities were reduced; carrot varieties resistant to *Sclerotinia libertiana* had lower bios contents, as did water melons resistant to *Fusarium* rot; resistance of potatoes to *Phytophthora infestans* was reduced when the sugar content rose; and wart-resistant potatoes were less active in converting carbohydrates than were susceptible ones. The last contribution to this section was Blackarm disease of cotton and its control, by R. L. Knight, who gives an outline of his work in the Sudan on the genetics of resistance to *Xanthomonas malvacearum*; 10 major resistance genes have been found and it is thought possible that others exist, particularly in *Gossypium punctatum*. The value of the different genes for breeding purposes is examined and it is concluded that in the drier tropics a combination of genes B_2 and B_3 seems to provide satisfactory control and when this resistance is intensified by the presence also of B_{6m} complete immunity is attained. The gene B_{6m} is thought to be promising also for producing forms that retain their resistance in the wet tropics, where that from B_2 alone breaks down.

In the discussion, reference was made to eelworm-resistant potatoes produced in the

Netherlands from crosses of material discovered by Ellenby (referred to in the text as Allenby) in the Commonwealth Potato Collection; to the promise of attaining potatoes resistant to infection by blight where breeding for resistance to biotypes has failed; to the possible production of oats resistant to frit fly; and to the use of toxins for selecting oats resistant to *Helminthosporium* sp.

Other sessions were devoted to mechanisms of toxicity, systemics, residual effects and user hazards and to crop-protection appliances.

WILLIAMS, R. E. O. & SPICER, C. C. (Editors)

Microbial Ecology. Seventh Symposium of the Society for General Microbiology held at the Royal Institution, London April 1957.

University Press, Cambridge 1957 : 32s. 6d. : Pp. viii + 388 : figs. : tables : plates.

The volume under review embodies the contributions to the Seventh Symposium of the Society for General Microbiology, held in London in April 1957. The introductory paper, The genome as a component of the ecosystem, by C. J. Shepherd, deals with the genetic basis of microbial variation. Cases are cited in which gene action is affected by changes of temperature, nutrition and other conditions of environment, but only, it is pointed out, within the range of the reaction norm of the given gene. Consideration is next given to various factors that may affect mutation rate, the view being expressed that cells may to a certain extent provide for their own spontaneous mutation through certain of the metabolic products reacting with their own genetic material; gene mutation is envisaged as occurring "by the single alteration in the equilibrium position of an atom, or electron, in the gene molecule". Variations resulting from chromosome alterations, transformation and transduction, heterocaryosis, polyploidy and a phenomenon referred to as aneuroploidy [*sic*] are considered and finally it is shown, very briefly, how a change in environment may lead to the selection of a mutant not otherwise more viable than the normal type.

In Micro-organisms resisting high concentrations of sugars or salts, M. Ingram gives some interesting information on the occurrence of osmophilic yeasts and of other organisms capable of withstanding high concentrations of sugar or inorganic salts. The effects of extremes of temperature, pH, oxygen and various nutritional factors on this tolerance are examined and the mode of origin of the tolerant organisms is discussed; a number of experiments in which no adaptive alteration in tolerance was observed are cited, side by side with others in which it was; in the latter case however the evidence is found to be distinctly insubstantial. All the recent research points to the fact that the internal concentration in organisms tolerant of high solute concentrations is equal to that in the medium in which they grow and that their enzymes are tolerant of such concentrations.

P. W. Brian writes on The ecological significance of antibiotic production, giving details of a number of organisms that produce antibiotics in the soil and concluding that their relatively high proportion among soil saprophytes can be taken as evidence that the production of antibiotics confers some selective advantage upon these.

The selective action on bacteria of various factors inside and outside the animal body, with particular reference to their effect on virulence, is treated by G. S. Wilson, who first discusses the concept of virulence in pathogenic organisms and the various factors which may raise or lower it. He concludes that changes in virulence in nature are the exception rather than the rule in bacteria, though viruses are recognized as being more prone to variation.

A number of other contributions dealt with the effects of factors such as pH, light, pressure, temperature and bacteriophages on microbial development.

DEMEREC, M. *ET AL.*

Genetic studies with bacteria.

Publ. Carneg. Instn. 1956 : Paper $0.80; cloth $1.00 : Pp. v + 136 : figs. : tables.

The nine papers in this volume give a report of research, chiefly on *Salmonella typhimurium*, at the Department of Genetics of the Carnegie Institution of Washington during a period of about sixteen months from the beginning of autumn 1954.

In the opening paper, Terminology and nomenclature, M. Demerec indicates the system of genetic symbols used in investigating mutants of *S. typhimurium* and *Escherichia coli*.

M. Demerec and Z. Hartman, in Tryptophan mutants in *Salmonella typhimurium*, present a detailed account of transduction experiments which have shown that four *try* loci are linked and that their order on the linkage map corresponds with their sequence in respect of the chain of reactions leading to the synthesis of tryptophane (cf. Abst. 2468). The changes at one locus which resulted in independent occurrences

of phenotypically similar mutants usually originated at different sites within the locus. The transduction method is shown to have a very high resolving power for the detection of crossing over between such sites.

In the next paper, Linked loci in the control of consecutive steps in the primary pathway of histidine in *Salmonella typhimurium*, P. E. Hartman, who also applied the transduction technique, reports a similar correspondence between linear order and sequence of biochemical reactions in the case of four closely linked *hi* loci, each separable by mutation and crossing over into a number of different sites.

T. Yura, in Evidence of nonidentical alleles in purine-requiring mutants of *Salmonella typhimurium*, describes the results of transduction tests by means of which 25 purine-requiring mutants were classified into well-defined groups, each corresponding to a single complex locus. This grouping was highly correlated with that based on biochemical properties. Direct evidence of linked transduction between nonidentical alleles was obtained. Investigation of spontaneous and ultraviolet-induced reversion revealed differences in the types of reversion as well as in the frequencies of reversion in members of the same group, additional evidence of the complex nature of the locus thus being provided. The data so far available are suggestive of linkages among the loci.

In a second paper, Suppressor mutations in purine-requiring mutants of *Salmonella typhimurium*, T. Yura gives an account of a procedure for distinguishing suppressor mutations among prototrophic reversions by transduction. A further paper on suppressor mutation is contributed by J. S. Gots: The biochemical nature of a suppressor mutation in a purine-requiring mutant of *Salmonella typhimurium*. The suppressor gene carried by a wild type of strain derived from one of the adenine-requiring mutants studied by Yura has been found to bring about the partial restoration of a synthetic step inactivated by the nonallelic gene in the auxotroph, which requires purines because of an apparent block in the carbamylation of a ribose derivative of 5-aminoimidazole (AIR) to the corresponding derivative of 5-amino-4-imidazolecarboxamide (AICA). The strain carrying the suppressor still has a partial requirement for purines; accumulation of AIR during logarithmic growth is equal to that in the auxotroph but at the end of this period AIR undergoes conversion into AICA.

In Abortive transduction of purine-requiring mutants of *Salmonella typhimurium*, H. Ozeki describes a case of such transduction in adenine-thiamine auxotrophs. The phage-transferred wild-type allele failed to be incorporated in the genome of the recipient cell and was unable to duplicate, persisting in one of the progeny as an extra and still functional entity. It appeared that a phenotypic modification to an adenine-pantothenate requirement affected daughter cells lacking the wild-type allele. This change resulted in the formation of minute colonies, each of which included the single cell carrying the wild-type allele and had the prototrophic phenotype. This modification, representing a phenotype intermediate between the wild type and recipient auxotroph, apparently persisted for several divisions until finally the progeny resumed the auxotrophic phenotype of the recipient cells. Abortive transduction, like the stable type, required the introduction of the wild-type allele into a recipient with mutation at the corresponding locus. Abortive transductions failed to occur between nonidentical mutations at the same locus.

Induced mutability in *Salmonella typhimurium* by Z. Hartman deals with a study of spontaneous reversion and reversion provoked by ultraviolet rays, $MnCl_2$, 2 : 4 : 6-tri(ethyleneimino)-1 : 3 : 5-triazine and 1 : 2,3 : 4-diepoxybutane in 8 mutants unable to ferment galactose and 15 requiring serine, induced by ultraviolet treatment of two wild-type strains. As already observed in *E. coli*, different mutagens produced specific effects upon a particular gene and some genes were stable against the action of mutagens to cause reversion to prototrophy. Eight out of the 23 genes studied were mutagen stable. These were all derived from one of the two original wild-type strains. The mutagenic potency of $MnCl_2$ was considerably lower than in the case of *E. coli*. Spontaneous and induced reversion were positively correlated. Other investigations have suggested that the mutants unable to utilize galactose represent a series of nonidentical alleles, and that 14 of the serine-requiring mutants also depend upon nonidentical alleles at one locus, the remaining mutation (*se*-10) belonging to another locus. Mutagen stability and specificity may therefore be determined by genic changes responsible for the differentiation of allelic sites rather than upon gene loci.

In the final paper, A comparative study of induced reversions in *Escherichia coli*, S. W. Glover reports data which confirmed the specificity of action of mutagens, which in this study consisted of ultraviolet rays, X rays, nitrogen mustard, 1 : 2,3 : 4-diepoxybutane

and 2 : 4 : 6-tri(ethyleneimino)-1 : 3 : 5-triazine. Twenty-four mutations for aminoacid requirements were investigated, the frequencies of reversion to prototrophy and streptomycin non-dependence being determined. The influence of genetic background upon mutability and upon general and specific stability against mutagenic action was demonstrated. The results obtained by Demerec (cf. *PBA*, XXIV, p. 141) for $MnCl_2$ and β-propiolactone were combined with those of the author, to compare mutagenic potencies and the patterns of reversion induced by different agents. Ultraviolet rays (200 and 600 ergs per mm.^{2}) and $MnCl_2$ emerged as the most and β-propiolactone as the least effective. $MnCl_2$ did not cause a pattern of reversion similar to that induced by any of the other six agents. This difference is brought into line with already-existing hypotheses concerning the modes of action of various types of mutagens.

Smith, K. M.
A textbook of plant virus diseases.
J. & A. Churchill Ltd., London 1957 : 2nd Ed. : 65s. : Pp. vii + 652 : 93 figs.

Some twenty years have elapsed since the publication of the first edition of this work (cf. *PBA*, VIII, p. 305). It is inevitable that in this time a great many more viruses have been described; the new edition deals with over 300 separate viruses. They are now listed in the order of the common English name of their hosts, so that the *Musa* viruses appear under abacá and banana, the *Brassica* viruses under cabbage, cauliflower, mustard, turnip and so on. There is however an index of synonyms which makes easy reference possible. The text has been almost entirely rewritten and maintains its authoritative quality. The illustrations have also been improved and this book, like its predecessor, will undoubtedly remain a standard work of reference for many years to come.

Smith, K. M. & Lauffer, M. A. (Editors)
Advances in virus research. Volume III.
Academic Press Inc., New York 1955 : $8.00 : Pp. ix + 339 : figs. : tables.

The contribution of most immediate interest to plant geneticists in this volume of the *Advances* (cf. *PBA*, XXVI, p. 322) is that by H. Ephrussi-Taylor on Current status of bacterial transformations, in which the evidence for regarding nucleic acid as the sole operative component of viruses and of genes is presented and discussed. The effective agent of bacterial transformation is shown to be DNA and after fractionation the most active fractions have been found to be those with a high content of guanine. It seems that the individual particles of DNA are composed of subunits which can mutate independently and mutation at one point does not necessarily affect the activity of other points along the molecule. Moreover, sections of the molecule can be exchanged, so that in transformations in which recombination occurs between physiologically differentiated markers linked on a single particle, the transformed bacterium propagates a DNA molecule in which part of the specific pattern has been determined by the inducing DNA, and part by the bacterium undergoing the transformation. How this transfer comes about now remains a matter for speculation and further research.
Most readers will be interested in the account of Morphology and development of insect viruses by K. M. Smith and other contributions in this issue include Cross protection between strains of yellows-type viruses, by L. O. Kunkel, and Comparative biochemistry and virology by S. S. Cohen.

Iso, E.
Rice and crops in its rotation in subtropical zones.
Japan FAO Association, Tokyo 1954 : Pp. xxxiv + 611 : figs. : tables.

Since the beginning of the century, the acreage under rice in Taiwan has been doubled and the yield almost quadrupled. The author has played a leading part during the last four decades in the research which has made possible this achievement. In this volume he gives an exhaustive account of the results of the investigations which have been carried out in that country during the past half century to improve rice and other crops used in the rotation system by developing better methods of cultivation and by breeding, frequently discussing the significance of the findings to rice production in other Asiatic countries. It is an important book which will be welcomed by agriculturists the world over, all the more so as much of the information provided has previously appeared only in Japanese. The success of this research is obviously due in a very considerable measure to the early recognition of the vital importance of physiological behaviour in breeding and to the unusually close integration between analysis of physiological factors and development of more economic systems of cultivation. The book therefore merits the attention of breeders and agronomists in general as a record of a model programme of crop improvement. The breeding

of the numerous Horai varieties of the *japonica* type, which, unlike introductions from Japan and the majority of the native *indica* varieties, are in most cases capable of giving good yields in both the first and second crops of double-cropped fields, has greatly contributed to the intensive utilization of the land, particularly in the central part of the island. By using these varieties, together with the *koa* system of interplanting while the first or second crop is still standing and keeping the surface wet, growing of summer and winter catch crops in double-cropped fields is possible. Breeding of specially adapted varieties or use of suitable introductions from other countries has also greatly contributed to the successful cultivation of each catch crop. The author divides the 40 chapters into seven parts on (1) general aspects, (2) rice, (3) sweet potato, (4) flax, (5) wheat, barley, oats and buckwheat, (6) vegetables, tobacco, groundnut, maize, rape and green-manure crops, and (7) jute, *Hibiscus cannabinus* and castor bean. The crops considered in the last part are included for their interest as possible substitutes for rice production. For each crop information is given on the various practical aspects of cultivation. A miscellany of such matters as storage of the product, utilization and manufacturing is also dealt with in chapters on some of the crops. In the section on rice, comprehensive chapters are provided on correlations among agronomic and physiological characters and their use in breeding, on the classification of varieties on the basis of responses to photoperiod, temperature and other environmental conditions, and on varietal distinctions not only in physiological behaviour but in the complete range of economically important characters. The origins of varieties, notably of the Horai group, are usefully indicated. A good deal of information on correlations of characters, varieties and breeding is also given for the winter catch crops sweet potato, wheat and flax. Typographical errors are numerous and the translation leaves room for improvement: these defects do not however seriously detract from the value of the book.

ROEMER, T. & RUDORF, W. (Editors)
Handbuch der Pflanzenzüchtung.
(Manual of plant breeding).
Paul Parey, Berlin & Hamburg 1956 : 2nd Ed. : Lief. 10 : Vol. 1 : Bogen 31–35 : 481–560; Lief. 11 : Vol. 1 : Bogen 36–40 : 561–640; Lief. 12 : Vol. 1 : Bogen 41–45 : 641–720; Lief. 13 : Vol. 2 : Bogen 16–20 : 241–320 : figs. : tables : DM 13.50.

The tenth instalment (cf. *PBA*, XXVI, p. 701) completes the chapter on selection and continues with Kreuzungszüchtung [Breeding by crossing], the first chapter of which, on crossing within the species, is by W. Rudorf. The second chapter, on interspecific and intergeneric crossing by E. Oehler, occupies most of instalment 11, which then continues with Mutationen und Mutationszüchtung [Mutations and breeding by mutation] by Å. Gustafsson and D. von Wettstein, completed in instalment 12, to be followed by the beginning of Polyploidiezüchtung [Breeding by polyploidy] by A. Müntzing. Instalment 13 completes the chapter on wheat and contains the beginning of Gerste [Barley] by K. Fröier, W. Hoffmann, E. Sandegren and H. Thunaeus.

A.H.C. handbook for plant originators and registrars.
American Horticultural Council, Arnold Arboretum, Jamaica Plain, Mass. 1956 : $1.00 : Pp. 43. (Mimeographed).

Prepared by the Commission on Nomenclature and Registration of the American Horticultural Council, this handbook provides explanatory versions of the International Code of Nomenclature for Cultivated Plants and the Code of Registration Procedure. Although compiled primarily for those concerned professionally and as hobbyists in the breeding or introduction of ornamental plants in the United States, the handbook will be welcomed by horticulturists in all countries, whether working on ornamental or crop species, as a most helpful guide to a highly technical and complex subject.

MAHLSTEDE, J. P. & HABER, E. S.
Plant propagation.
John Wiley & Sons, Inc., New York & Chapman & Hall, Ltd., London 1957 : 60s. : Pp. x + 413 : figs. : tables.

In their preface the authors state that the writing of this book was prompted by the need for bringing together in a comprehensive form both the basic principles and the practical aspects of plant propagation. All whose interest lies in any part of this wide field will be grateful that they have achieved their object so successfully and at the same time in such a readable form. The text falls into five sections, basic concepts and principles of propagation, sexual propagation of higher plants, asexual propagation of higher plants, propagation structures and propagation of specific plants. In addition three tables are provided outlining the methods of propagation to be used for nearly 250 common ornamental plants.

In each section such basic principles as are necessary to an understanding of the methods

used are discussed first, followed by practical details. Thus in the section which will be of most interest to readers of *Plant Breeding Abstracts*, on the sexual propagation of higher plants, the first chapter describes in detail the origin and development of seeds including the principles of hybrid seed production, later chapters describing the collecting and cleaning of seeds of a large number of crop plants, seed treatments and factors influencing the success of seed propagation.

The book is excellently illustrated by means of photographs and diagrams, although the first and third photographs in the series on pp. 226–7 have unfortunately become interchanged. Each chapter is provided with a list of selected references and the book is completed by a good index.

WALKER, J. C.
Plant Pathology.
McGraw-Hill Book Co., Inc., London & New York 1957 : 2nd Ed. : 75s. : Pp. xi + 707 : 194 figs. : 3 tables.

Intended to provide a guide to the general principles of plant pathology rather than to serve as a manual of disease descriptions, this book offers both a comprehensive survey of well known representative diseases and a useful account of various aspects of control. The scope is wide but the presentation is well balanced. After an introductory chapter on terminology, there follows an interesting and informative review of the history of the study of plant diseases up to the early twentieth century. The descriptive section of the book comes next, comprising ten chapters on non-parasitic disorders and diseases incited by bacteria, Plasmodiophorales, Phycomycetes, Fungi Imperfecti, Ascomycetes, Basidiomycetes, phanerogamic parasites, nematodes and viruses. Each of these chapters gives first a general account of the group under discussion and then descriptions of individual representative pathogens, the information provided on each organism covering host range, symptoms, synonyms, life cycle, disease cycle, methods of control and, in many cases, some details of varietal resistance and variation in pathogenic virulence.

There are two general chapters on factors affecting the occurrence of disease, the one dealing with external environmental effects and the other with physiological and anatomical interactions between host and parasite.

The three final chapters are concerned with methods of control through exclusion and eradication, through protection by means of appropriate management and chemical treatment and through the development of resistant crops by breeding.

Revision of the first edition of 1950 has brought each section of the present volume up to date and this, together with its efficient index, good illustrations and abundant references should make the volume a valuable introductory text book for students of plant pathology.

USBORNE, J.
Corn on the cob.
Rupert Hart-Davis, London 1956 : 9s. 6d. : Pp. 104 : figs. : tables : plates.

The author of this enthusiastic and very readable booklet affirms that what happened to maize in the thirties firmly established America in the role she was destined to play in the world. And what happened was of course the advent of hybrid corn, which made it possible to grow 600 million more bushels of maize from 14 million fewer acres and so free these for growing 250 million bushels of soya beans. The principles of hybrid maize are elucidated in picturesque, if somewhat unscientific, language and the role that maize has played, and will increasingly play, in European agriculture is enlarged upon. Interesting references are made to how "in 1803 the great William Cobbett entertained Mary Mitford to a meal which included 'Indian Corn' grown on his farm at Botley near Southampton"; how the author "first ate sweet corn at a dinner party in South Audley Street in August of 1936. It came on in glorious isolation as an hors-d'oeuvre, like asparagus, and, like asparagus, accompanied by melted butter from silver jugs"; and how in 1945 he made a profit of £53.5.10 from a quarter of an acre of Golden Standard. In 1947 he changed to Canada Cross, produced by the John Innes Horticultural Research Station, which variety matured about ten days earlier and was "more delicious to eat": on 10 September 1949 it provided a "corn roast" for a local Surrey cricket team and a visiting team from Hampshire. Country Gentleman, introduced from America, proved more delicious still but was often too late in ripening and is recommended only with reservations. As for popcorn, some success is reported for Rice but Dynamite, though it produced good grain, never popped.

The merits of maize as a farm crop are examined and in referring to the experiments carried out by the National Farmers' Union the author declares that he is "authorized to state that there can be little doubt that hybrid maize seems likely to become an important and possibly vital part of the English agricultural

economy"; it seems that it yields up to two tons of shelled grain to the acre and in dry matter "from 35 to 45 cwt. per acre, from eight to ten times the yield of fodder beet". An improvement of 100% in yield and 10–14 days in earliness is predicted in the next ten years.

Advice on how to grow maize includes the enumeration of the hybrids, one American hybrid, Wis. 240, and five Dutch, that have been found suitable for the climate of southern England, all of them said however to be some ten days later than Golden Standard.

Instructions are given as to how to pop corn, how to cook sweet corn and how to prepare a corn roast, after which there comes a whole chapter of recipes for cooking maize in its various forms, where the reader is introduced to the delights of such exotic dishes as corn chowder, slumgullion, polenta, torta and tortilla, and others more modest, at least in name, such as corn pudding, square corn or corn cabbage.

TROUGHTON, A.

The underground organs of herbage grasses.

Bull. No. 44 of the Commonwealth Bureau of Pastures and Field Crops, Hurley : Commonwealth Agricultural Bureaux, Farnham Royal 1957 : 25s. : Pp. ix + 163 : 16 figs. : 55 tables.

The author, who is a member of the staff of the Welsh Plant Breeding Station, University College of Wales, Aberystwyth, has written a useful review of the world literature on the above subject. In the first part the organs under consideration are described, chapters being given on seminal roots, nodal roots, anatomy of nodal roots, root hairs, underground organs other than roots, growth of the young plant, the seasonal growth cycle, length of life of a nodal root, root weight as influenced by the age of the plant, distribution of roots in the soil, genetic differences, chemical composition and root exudates. Part II, dealing with the environmental factors influencing the growth of these organs, consists of chapters on soil water, soil temperature, physical conditions of the soil other than water supply and temperature, hydrogen-ion concentration of the growth medium, light received by the shoot, defoliation, root pruning, mineral nutrition and interaction between plants growing together. In Part III the effect of the plant upon the soil is considered in chapters on the organic matter, structure and erosion of the soil. The final part surveys methods employed in the study of underground organs. An appendix providing information on the weight of roots produced by swards of different species in various countries, a bibliography and subject index complete the bulletin.

SMITH, C. P.

Species Lupinorum. (Species of lupins).

Saratoga, California 1938–53 : Pap. 1–105.

Under this title the author intended to publish a complete review of the genus *Lupinus* in both America and the Old World. In all 44 sixteen-page "signatures" appeared, comprising 104 papers dealing with the lupins of North, Central and South America and one brief paper reporting the occurrence of an introduced species in South Africa. The scope of the papers varies considerably, some describing a few species from several countries and others covering a large number of species from a particular part of a country, in the case of South America and the North American States. In many cases there may be more than one paper dealing with the lupins of a particular region, for example 20 papers on Peru, 12 on California, 11 on Mexico and eight each on Idaho and Nevada. Unfortunately as the papers are not grouped together frequent amendments and references to previous papers are inevitable. Some of the longer papers include keys for the identification of the species described therein, an index to the first 100 papers is given as paper 101 and a summary of the first 18 papers on Peruvian lupins is provided; apart from these aids there is some difficulty in finding one's way around the work as a whole owing to the method of publication adopted.

Potato handbook. Disease control issue.

Potato Association of America, New Brunswick, New Jersey 1957 : Vol. 2 : $2.00 : Pp. 79 : figs. : tables.

The Potato Handbook, the first issue of which was published in 1955, is compiled chiefly with the commercial potato grower in the USA in mind. The 1957 issue contains nine articles on methods of controlling diseases, reference being made to the role of resistant varieties in the chapters on common scab, bacterial ring rot, *Verticillium* wilt, late blight, viruses and southern bacterial wilt. Other features of interest include a buyer's guide, statistics on production, information on certified seed agencies and a list of publications of interest.

BURGESS, A. H.

Hop growing and drying.

Bull. Minist. Agric., Lond. 1956 : No. 164 : Pp. 62.

The greater part of this informative bulletin has

been contributed by Dr. A. H. Burgess, with chapters on hop diseases and pests by Dr. H. H. Glasscock and Mr. B. D. Moreton. The result is a complete guide to hop growing, including descriptions of varieties, details of training systems and cultural practices and advice on picking, drying and marketing. Excellent photographs illustrate various stages of growing, picking and drying and typical symptoms of the more important diseases. Advice on the control of pests and diseases is given and the bulletin concludes with a list of the references cited in the text.

LIBBY, W. J., BARNES, B. V. & SPURR, S. H.
Forest genetics in the lake states. An annotated bibliography.
School of Natural Resources, Ann Arbor, Michigan 1956 : Pp. 74.

This annotated bibliography gives a useful indication of the scope of the literature available on the genetic improvement of forest trees grown in Michigan, Wisconsin and Minnesota. Arranged alphabetically according to author, it covers work done in these states and relevant investigations in other countries. Some papers dealing with forest-tree genetics in general are included. The annotations are in part original and in part quotations from published abstracts and from the various publications themselves. The subject index follows the Oxford system of decimal classification in forestry. A reader wishing to pin-point publications on particular aspects of evolution, genetics and breeding, ecology and regeneration will be well served by this index. Anyone wishing for all the information on members of a particular genus will have to do his own tracking down from this index.

KAMPE, K., BASSE, H., GLASCHKE, B. & SCHREIBER, F.
Gemüsesorten. **(Vegetable varieties).**
Paul Parey, Berlin & Hamburg 1955 : Pt. I : DM 7.80 : Pp. 98 : figs. : plates : tables; 1956 : Pt. II : DM 9.80 : Pp. 122 : figs. : plates : tables.

The two parts of this small handbook give descriptions, supplemented by photographic illustrations, of all the main types and varieties of vegetables at present cultivated in Germany. The first part deals with French beans, scarlet runners, peas, broad beans, cucumbers, tomatoes, onions and leeks. Part II is devoted to the *Brassica* vegetables, lettuce and other salad plants, and roots, which include radishes, celery and scorzonera.

Each volume contains a list of the breeders in whom are vested the proprietary rights of those varieties that have been patented.

NEW JOURNALS

***Agricultura técnica en México.* (*Technical Agriculture in Mexico*).**

This new journal has as its object the rapid diffusion among the growers of the results of scientific investigations in the research stations. Rust-resistant wheats, new varieties of bean and tomato and successful new maize hybrids are among the subjects treated in the first few numbers, all referred to in this issue of *Plant Breeding Abstracts*.

The journal is published by the Secretaría de Agricultura y Ganadería, Dirección General de Agricultura, Balderas 94, México, D.F.

Sunshine State Agricultural Research Report.

This journal, the first issue of which appeared in January 1956, is designed to keep farmers and the general public in touch with research in progress at agricultural experiment stations in Florida. The first issue includes a report on hybrid maize trials and a popular article on the breeding of southern peas (cf. Abst. 2645). The journal is published quarterly and may be obtained, free of charge, from Agricultural Experiment Stations, University of Florida, Gainesville, Florida.

Vitis

Vitis is the organ of the Bundesforschungsanstalt für Rebenzüchtung [Federal Research Institute for Vine Breeding] in Federal Germany. The first number, which has just appeared, contains articles on genetics of vines, pollen grains with abnormal pore number in hybrid and polyploid vines, the effect of root system on drought resistance and a method of infecting vine seedlings with *Pseudopeziza tracheiphila*. All these will be abstracted in *Plant Breeding Abstracts*, Vol. XXVII, No. 4.

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